A Hayden Publication June 1982 $2.00

PERSONAL COMPUTING

Computer Games: A Look From The Future

Educational Software Survey

How Some Managers Are Motivating



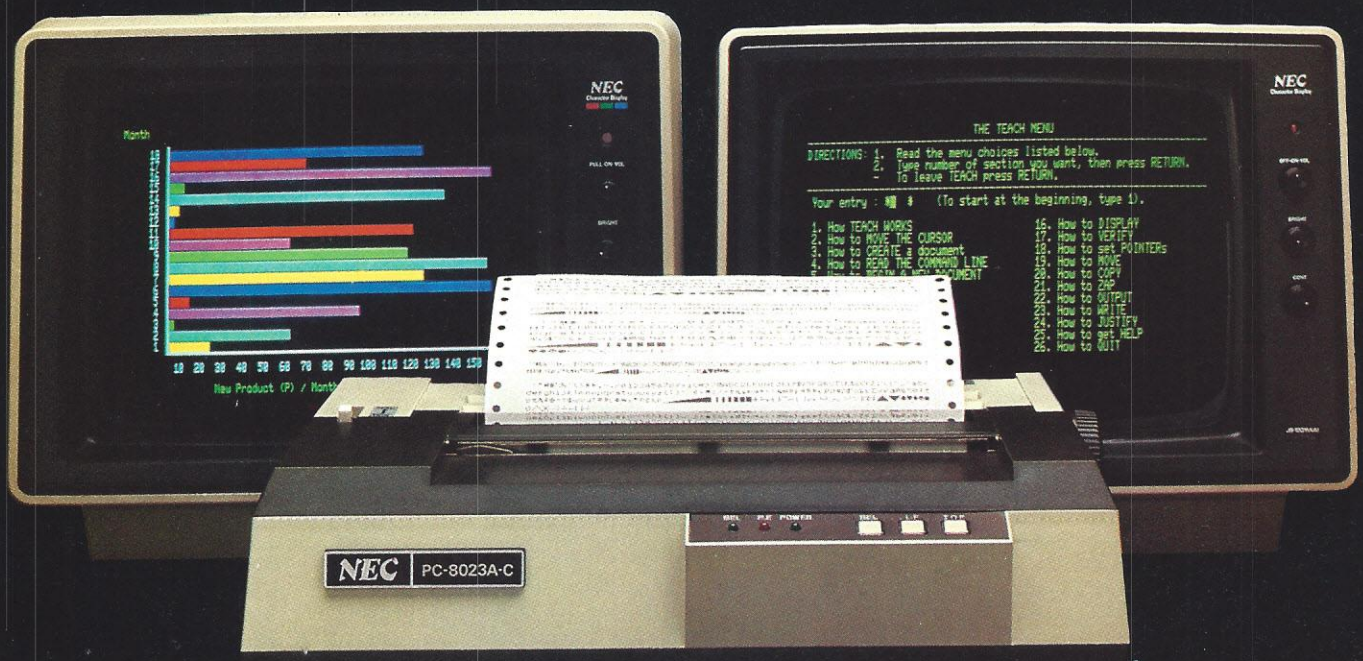
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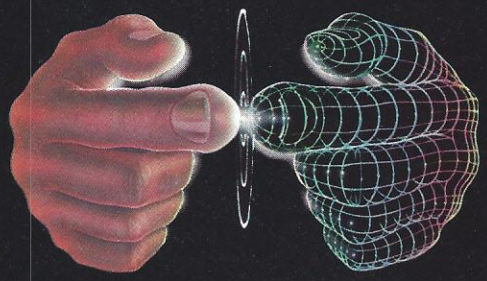


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CIRCLE 2

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COVER ILLUSTRATION
GREG BROWN

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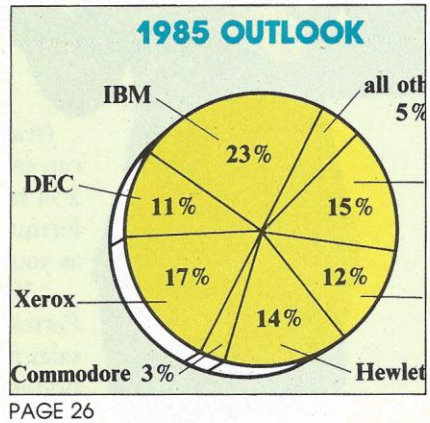
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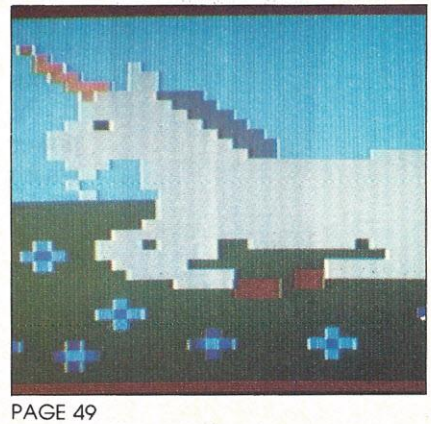
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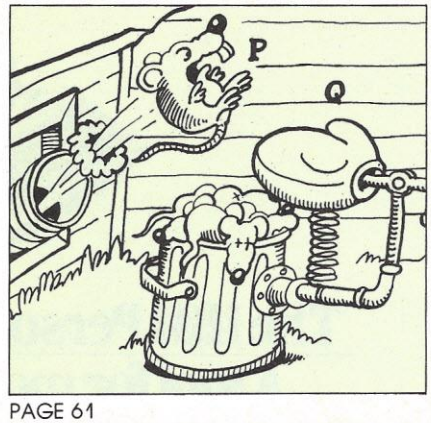
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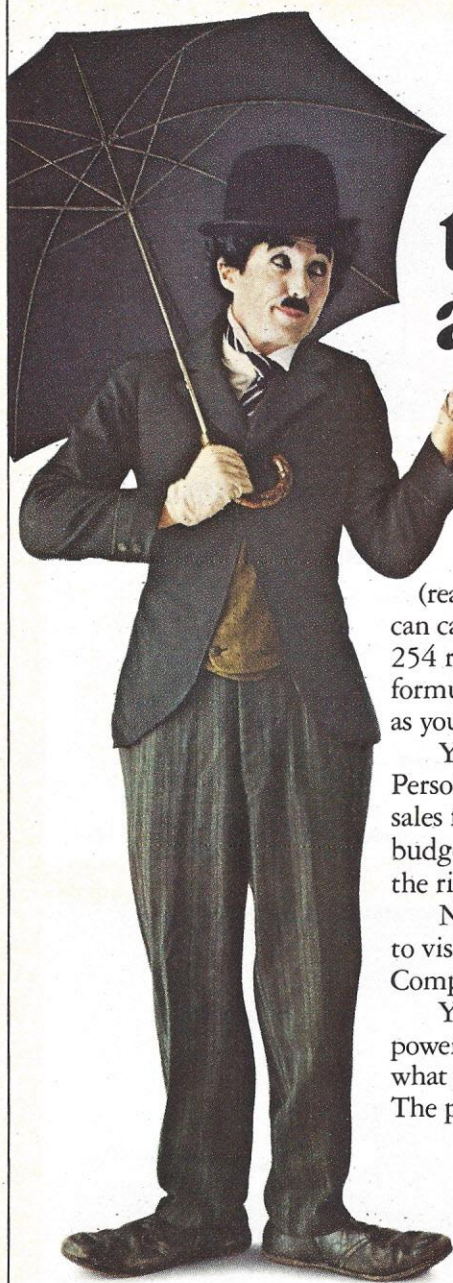
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How to change a forecast.

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CIRCLE 3

COMING NEXT MONTH

Those Information Arsenals Known As Data Bases

How do you know which data base to choose when there are hundreds available? What's a typical session like with an on-line data base? Read the who, what, where, and how of going on-line.

Exploring Operating Systems

Although a CP/M operating system is difficult to use, it's a way to make the world of business software available to you. Yet some manufacturers are moving to other operating systems. Why? And what is available to make CP/M easier?

Traditional Accounting The Modern Way

There's a new twist on an old theme: Accountants are encouraging their clients to use personal computers at home before visiting the accountant's office. All relevant financial data is input before the client's visit, smoothing the way for easy and accurate looks at one's financial standing. Who is doing this and what hardware and software are being used? How does the client really benefit?

Self-Improvement Software Survey

Would you be doing what you are doing now if you had known then what "now" looks like? Colleges are using computers to aid students build their career paths by offering them looks at different job scenarios.

Analog-To-Digital Conversion Software

As a follow-up to our conversion hardware article in this issue, next month we present information on the available conversion software—software that allows the personal computer to control the real world.

Let's Be Smart

There are some things we just can't do, even though we might think we can.

That's usually OK. The problem comes when, because of a misunderstanding, we use a tool for a purpose for which it was never intended.

Even that's usually OK. But the problem arises when the misused tool is as important as personal computing. Then the usual reaction to such misuse in the U.S. is an attempt at regulation.

I began reflecting in this vein one evening after the work was done. A mythical conversation came to mind, and it gave me pause.

The Ambassador from a Latin American nation was in Washington on the phone with his Foreign Ministry back home.

"Minister," he said excitedly, "I am pleased to see that you have taken the steps you have. The colonial powers have to be taught a lesson. And as far as the Americans are concerned, they will talk, but not act."

The Foreign Minister, on the other end of the line, was pleased to hear these reassuring words. After all, it isn't every day a small nation challenges the former Ruler of the Seas.

He wondered, though, why the Ambassador was so sanguine.

"My friend," he said, "why are you so sanguine?"

"It is simple, Minister," came the reply. "I know we will be victorious. As I have assured you, America will do nothing. Without the aid of the Americans, the colonialists cannot support their fleet over the incredible distances that must be traversed."

The Foreign Minister thought fleetingly of his vacation retreat in the Andes Mountains. Sighing, he put such thoughts out of his mind.

"My friend," he said, a bit wearily, "I am pleased that you express such confidence in our force of arms. But you must know that we took the steps we did knowing that it might be possible that fortune would not smile on our armies. Further, we think that the actions of the Americans are more unpredictable than you seem to think. So I would appreciate from you a more careful study of the possibilities and probabilities of actions as they are seen in that capitol."

"There is no need, Minister," said the Ambassador. "I can tell you that I have carefully considered all the alternatives, and I am sure that my scenarios for the future are correct."

The Minister wondered how he could be so sure.

"My friend," he said, "how can you be sure?"

"Well, Minister," the Ambassador enthused, "I must tell you. These Americans have a terrific tool here that they call the personal computer. It can do many things—so many that even the Americans don't know everything it can do. In fact, people actually go around saying, 'What else can I do with my personal computer?' So I got one, called a Banana."

"Wait a minute, my friend," the Minister interrupted. "You bought something called a personal computer that is also called a Banana?"

"Please, Minister, let me finish. I went out and bought a wonderful program for my Banana. It's called Middle-Eastern Front. It's a simulation game of the war that the British fought against the Turks in the Middle East as part of World War I. And then I . . ."

The Minister was getting steamed by this time. "I don't believe that you are telling me this, my friend," he said as softly as he possibly could.

"You didn't let me finish," said the Ambassador. "I used the game to find out what would happen if certain scenarios came to pass."

"What," roared the Minister, "does a game called Middle-Eastern Front have to do with the situation we are facing right now?"

"Oh," said the cheerful Ambassador, "I modified the software to take our current situation into account. I recalled that the generals who fought in the deserts of the Middle East likened that warfare to combat at sea. So I thought the software for the game could easily be modified, so I proceeded to do just that. And as I said, . . . "

The Foreign Minister cut him off. "I can see now why you think the tactical situation is favorable," he muttered, patiently. "But why do you say that the Americans will do nothing? Surely your Middle-Eastern Front didn't tell you that."

"You are absolutely right, Minister," agreed the Ambassador. "I have another game, called "When Big Businesses Collide, and I . . . "

"Let me guess," the Minister fumed. "You modified the software, because you reasoned that the actions of governments aren't that different from those of large corporations."

"Minister," said the Ambassador, "you should get your own Banana. You've really caught the spirit of this thing."

Of course, it didn't happen. What do you suppose would be the response of government if something like this did happen?

Remember, government responded when it found that personal computers are potential sources of electronic noise, by requiring manufacturers to add expensive parts and material to computers that are used in the home.

Let's use personal computing wisely. Let's not mess up this great thing we have. We could mess it up. Then someone else will be happy to tell us what we need, when we need it, and how to use it, to enjoy personal computing. Let's not do that.

Let's be smart.





A simple fact:

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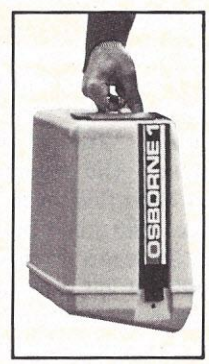
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ADDENDUM

When we printed a story about spreadsheet software in our April issue, we neglected to mention several products that are available. In an effort to keep our readers as up-to-date as possible, we would like to add the following available spreadsheet programs.

Stay current in this area by watching our new-products section, where new programs are announced as they become available.

Best Plan $495
Best Company
30192 Via Borica
Palos Verdes, CA 90274
CIRCLE 435

Easy Calc $49.95
Instant Software
Route 101
Peterborough, NH 03458
(603) 924-9471
Runs only on the TRS-80 Model I and Model III.
CIRCLE 436

Forecaster $145
Software Establishment
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Master Planner $495
Comshar Target Software, Inc. (formally AMSI)
1935 Cliff Valley Rd.
Atlanta, GA 30329
(404) 634-9535
Master Planner is CP/M based, 48k minimum
CIRCLE 437

Microfinesse $495
Osborne McGraw-Hill
630 Bancroft Way
Berkeley, CA 94710
(415) 548-2805
Microfinesse runs on the Apple II, and is a Pascal program. It has target search and sensitivity analysis.
CIRCLE 438

Microplan $495
Chang Laboratories
10228 N. Stelling Rd.
Cupertino, CA 95014
(408) 725-8088
It is CP/M based, runs on CP/M 2.2 and CP/M 86; the minimum RAM requirement is 64k.
CIRCLE 439

Multiplan
Microsoft
400 108th Ave. NE
Bellevue, WA 98004
(206) 828-8080
CIRCLE 440

Plan 80 $295
Lifeboat Associates
1651 3rd Ave.
New York, NY 10028
(212) 860-0300
It runs on any machine that supports 56k; it has two versions 8080 and Z80.
CIRCLE 450

Report Manager $200
NEC Home Electronics
Personal Computer Division
1401 Estes Ave.
Elk Grove Village, IL 60007
(800) 772-2666 (ext. 1000)
It is produced for the PC 8000 microcomputer made by NEC.
CIRCLE 451

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Supersoft, Inc.
P.O. Box 1628
Champaign, IL 61820
(217) 359-2112
CIRCLE 452

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SoHo Group
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I LOVE COMPUTERS, BUT . . .

Since I love computers, I would love to subscribe to your magazine, if I had an Apple or TRS-80 computer. But I don't, I have a Texas Instruments 99/4A. I like this computer very much and I believe I got a lot of computer for my money. In the three issues that you sent me I didn't see an article about my computer or any software pertaining to it. This disappointed me, and even though I enjoy reading about Apples and TRS-80s that information doesn't help me much. I am not saying that you should gear your magazine entirely toward the 99/4A, but a good article now and then would be very much appreciated by many others besides myself.

Alex Alexander
RIVERTON, NJ

"Hayden's *Personal Computing* magazine's accuracy policy: to make diligent efforts to insure the accuracy of editorial material. To publish prompt corrections whenever inaccuracies are brought to our attention. Corrections appear in 'Letters.' To encourage our readers as responsible members of our business community to report to us misleading or fraudulent advertising. To refuse any advertisement deemed to be misleading or fraudulent."

EDITOR'S REPLY: *Since* Personal Computing *is a magazine about people and their use of computers, we don't look for applications on specific computers. When an interesting use of any personal computer comes to our attention, we diligently try to write about the people involved in that particular use.*

A CRY FOR THE COLOR COMPUTER

I enjoyed the March 1982 issue, and wish to express some thoughts. As a Color Computer owner, the one thing that has bothered me is the nonrecognition of this product by many advertisers.

Most advertisers who do not have Color Computer software available typically say " . . .available for your TRS-80 . . ." I wish to point out that the C.C. is, in fact, a TRS-80 machine and deserves attention as such, or at least recognition as such. It's a fine machine, capable of many new and interesting features, and once it takes a hold on the marketplace it will surprise anyone who doubts its capabilities.

Ray VanDervort
VESTAL, NY

BURIED BY BUZZWORDS

As a new subscriber to your magazine, I'd like to say that I find it very informative and helpful. There are a lot of folks like me out there who are new to personal computers, and know nothing more than what they read in computer manuals.

LETTERS

I have tried other magazines but find that they bury me in technical jargon that is not only above my head, but unrelated to my interests and purposes. Your magazine staff seems to be more aware and sensitive to the needs and problems of people like me.

Keep up the great work.

Bob Symonds
MANCHESTER, CT

TAKING STOCK

In your February 1982 letters column, James Franks showed interest in computer programs for stock-market analysis. Most programs on the market stress portfolio management. Many users are more interested in stock analysis.

Apparat is now marketing my program for stock-market analysis. The package contains four programs. The options program gives profits or losses for various put and call strategies. Broker fees are estimated. Gains are shown as percent per year rather than percent for the period of the trade.

The stock-evaluation program calculates consistency of earnings growth, rate of earnings growth, and reward to risk ratio; the user makes all critical decisions.

The running-average program allows the user to select long- and short-term averages. It also identifies the relationship between the long- and short-term averages.

The trend-analysis program helps users identify overbought and oversold situations. It uses a formula that was developed for commodities; it also works for stocks.

The programs require a TRS-80 Model I or III with 32k memory and a single disk drive.

Henry L. Lefevre
DENVER, CO

A TIMELY RESPONSE

I wish to express my gratitude to *Personal Computing* for the fine article "Time Management: Business In Its Finest Hour" on page 34 of the March 1982 issue, which described my company's software, Time Deadline Calendar/Scheduler.

The first complete paragraph on page 36 includes the phrase, "Programs like the one Smith is using allow the user to rate jobs by priority, so that important work is completed by the deadline." This is true but could be taken the wrong way.

Actually, the program schedules work so that all jobs are completed by the deadline date given for each job. One might ask, "So what happens if more work is scheduled than there is time to complete? How can all deadlines be met in this case?"

What happens is that some work is scheduled for yesterday or the day before. Then the user, knowing this is an impossible schedule, can tell the computer that more hours are available per day. Or the user can change some of the deadline dates or other job parameters, and then print a new schedule.

The system pushes all jobs forward so that they are completed as near to the deadline as possible. A priority rating determines which jobs are to be started close to the deadline date. For example, a priority of nine can be used to schedule appointments, although appointments may not be considered as jobs to some readers. Other types of jobs are information dependent, and it is best to wait until the last possible day to start the job because information may change. This type of job is given a priority of eight. On the other extreme, some jobs can be started and finished way ahead of the deadline date. These are given a priority of one.

Charles B. Lefkoff
WASHINGTON, DC

MAILING-LIST MANIA

Thank you for the excellent article on mailing lists on page 76 of your January 1982 issue. However, our MAIL-X was not included in the article. It offers the following features:

- A sort and merge package;
- A data base that can span up to three drives (up to 10,000 records on a four-drive TRS-80 Model II, or 32,000 on hard disks);
- User-specifiable field names, field sizes, record sizes and three- or four-line lables;
- A report writer.

This package is available for the TRS-80 Model II. Simplified versions are available for the TRS-80 Model I and III, and Zenith.

Tony W. Pow
PRESIDENT
MICRO ARCHITECT

GOING DOTTY

Thank you for the article "Word Processing: the A to Z of Software" on page 72 of the March issue. The comparisons between the various word processors were excellent, although I must correct some minor errors. I have been using Word Pro 4+ (Professional Software) for two years. There were a few features that you did not list.

- You can jump to the middle of the screen—or any line you would like with the GOTO command;
- Blocks on the screen can be erased by specifying the range of lines to be deleted;
- There is a search-only capability (called find and hunt);
- You can center justify text with the "cn1" command;
- You can reverse indent with the "ma" (margin release) command.

Gary M. Oppenheimer
LONG BEACH, CA

In the Interview with Jim Dowe in our May issue, we inadvertently omitted the answer to the question, "Does this (Dowe's product SAVVY) mean that programmers won't be needed anymore?", which was, "No, we will always need programmers. It's more a matter of what type of programmers will be needed. For example, you wouldn't want to use our machine to do matrix operations or scientific calculations. For that you really need a language like APL or FORTRAN. But this technology will change the emphasis of a programmer's work from programming to systems analysis. The robot programmer, SAVVY, will do the programming once the systems analyst has defined what the problem is. So the systems analyst who currently goes to a human programmer will instead go to his robot programmer and say, "Concoct a program that does such and such." This will free up programmers, who are in short supply, to concentrate on systems analysis and design."

The answer didn't get into the May issue because it wound up on the cutting-room floor by mistake. The cutter has been flogged.



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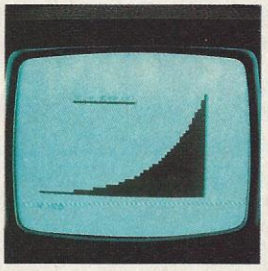
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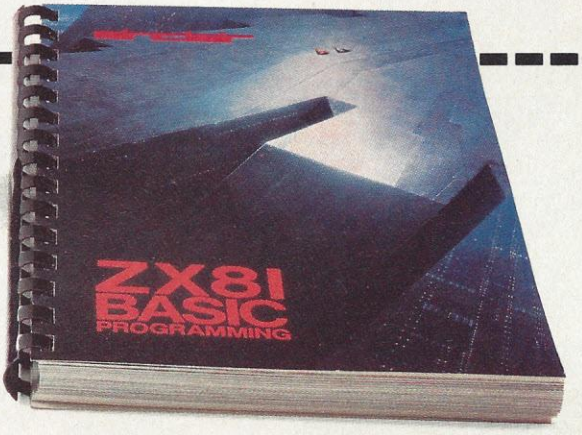
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CIRCLE 7

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Which Medium Should Hold Your Message?

In this new monthly column, "Answers," we will respond to your most frequently asked general questions about personal computing. Please send your questions to: Answers, Personal Computing, *50 Essex St., Rochelle Park, NJ 07662.*

Q: Are videodisks the coming thing in mass storage?

A: Videodisks offer tantalizing advantages, and one overwhelming disadvantage: Information written on them can't be erased or changed. On the other hand, the heads on a floppy disk drive physically rub on the disk. So there's wear on the disk and head, and a small amount of debris gets rubbed off. Also, what magnetism created magnetism can uncreate, or garble. So magnetic disks (and tapes and strips) are vulnerable to magnetic vandalism—intentional or otherwise.

Some types of videodisk players use a stylus, but this method is irrelevant to computing. The laser-type videodisk, which is capable of much greater resolution, reads and writes with light. There's no physical contact between head and disk. And information can be stored with incredible density in patterns of tiny laser-burned pits in the recording medium. So the benefits and problems (from the personal-computing standpoint) come from the same thing. That is, all the vulnerability of magnetic data storage is eliminated by using a physically pitted surface interacting with light beams. But no one has found a practical way to unpit a pit, once it's been pitted.

So videodisk technology offers great promise in two areas. First, it provides a great medium (at least theoretically) for archival data storage—possibly the most compact and stable medium we know of. Second, it could be used to hold applications programs very effectively. However, the program would have to be transferred to a magnetic medium before a user can interact with it. Such interaction occurs in two basic ways. A user can modify the program to configure it to his particular requirements and hardware configuration. And he stores the data and whatnot he generates—the products of his computing. Both processes require interactivity, and only magnetic media can accommodate them.

Now as with all things technical, someone could be discovering how to make videodisks interactive even as this is written. But be assured that such technology would be quite a while getting into a local computer store. And at the present time, much of the high storage and general reliability of videodisks is available with hard disk drives, which use heads that don't touch the disks, and are currently available for most computers.

Q: I'm getting a personal computer, and I haven't been able to decide whether I need two disk drives or just one. What do you think?

A: The most pernicious mistake computer-system buyers make is encompassed in this question. Software comes first. Some software works fine with one drive; some requires two. When you have found the software you need for your applications, you will know whether you need two drives.

But, you might ask, which types of software require two drives? There are two kinds. One kind comprises programs too large for the RAM (Random Access Memory) of the computer. These will store most of the program on disk, swapping the relevant parts in and out of RAM as needed. And some programs are so large as to require the services of two disk drives just for themselves. But even those that don't will need a data disk on which to store the fruits of your labor. If a program can be loaded entirely into the RAM, a data disk can then be inserted into the drive, and only one drive is required.

Q: I plan on hooking my computer up to a color TV, but I've heard there are special color monitors. Do these have advantages that make them worth the extra money?

A: Possibly not for home use. For commercial use a color monitor should be mandatory. The reasons have to do with both resolution and range of colors.

Color computing doesn't actually divide between monitors and TVs. It divides between composite and RGB (red-green-blue). All TVs and many monitors use composite-video imaging. Here the color information is encoded into a single data stream. This is both slow and somewhat inaccurate. The monitor has to translate the information into the three colors used to generate the hues seen on the screen. The transitions between one color and another create blurs between colors. Since it takes time to tell the monitor, sequentially, what colors it has to generate, it tends to fuzz up motion, too.

RGB monitors require circuitry in the computer that transmits the color information in three data streams simultaneously. Each electron gun (there are three, one for each color) in the CRT (Cathode Ray Tube) is controlled separately. This makes for sharp color transitions. Computers containing RGB circuitry include the Apple III, Cromemco, IBM Personal Computer, Monroe and NEC. Electrohome makes a peripheral board

for the Apple II that generates RGB signals. Other computers, generally, output composite video if they have color at all, though perhaps RGB boards will become available for them, too, in the future.

In every case, however, the guns fire their electrons at phosphor dots on the inner face of the CRT. Color monitors have dots (or pixels) composed of three subdots.These subdots are made of a phosphorescent material that gives off the appropriate color (red, green or blue) when struck by electrons. If more electrons hit a subdot it gives off a more intense color. The electron guns fire through a mask pierced with holes. The size of the holes and the phosphor dots determine resolution.

High resolution is determined by more than whether the monitor (or TV) is RGB or composite, though. RGB monitors tend to have better resolution because they have large bandwidths. A large bandwidth allows a lot of information to flow in a given period of time, like a large inside diameter of a garden hose allows a lot of water to flow in a given period of time. If someone is trying to spray water over a large garden, he needs a lot of flow or he needs to slow down the rate at which he moves the hose back and forth across the garden. If a monitor doesn't use a high bandwidth design, it has to paint the image on the screen slowly, using highly persistent phosphors. This makes it impossible to change the image quickly without blurring it.

Good RGB monitors cost $100 or more above the prices of composite-video monitors. Color monitors come in several grades of resolution, from several hundred to over 700 dots (pixels) per horizontal line. They are priced accordingly.

It might be possible to economize by using the color monitor for traditional monochrome uses like word processing. While there is some work being done using color to enhance these applications, monochrome resolution is much higher. That's because monochrome phosphor dots are a third the size of the color ones. Color monitors generally generate a monochrome image by activating just the green gun. But since just a third of each three-times-as-large dot is being activated, with the others black, the images generated this way have spaces between the dots. A user would be well advised to try this at the dealer's before purchasing a good monochrome monitor. Monochrome-level resolution is theoretically possible with a color design. A monitor that accurate would cost a lot, though.

There are several other considerations, too. Color monitors often lack FCC clearance. It would be wise to make sure a monitor has FCC certification before using it in the home. At least get a trial-use authorization for one that lacks it. The other thing to look for is analog circuitry. Analog design (where signals can be continuous, not only on-off, like digital signals) allows for finer shadings of colors. An analog monitor can modulate the strength of the electron beams as well as their direction and timing. This allows for the fine color shadings. All-digital monitors typically have about 10 colors instead of hundreds available.

Users will have to weigh pocketbook against anticipated use to decide whether all this technology is worth the tab. But at the very least it would be smart to look at a high resolution RGB monitor before buying anything less.

Q: What are the main computer languages, and which is the most common?

A: Ada, ALGOL, APL, BASIC, C, COBOL, Forth, FORTRAN, LISP, LOGO, Pascal, PILOT, PL/1, PL/M, RATFOR, RPG, Smalltalk, SNOBOL, tiny BASIC, assembly languages for each machine or, ultimately, machine language. Various other languages listed come in different forms, or dialects.

BASIC is the most notorious for existing in umpteen versions with varying degrees of compatibility. Some of these languages only work on larger machines, some are mainly for kids, some are pretty antique, some leading-edge. You'll still probably learn some form of BASIC, however, if you learn any. Or you could spend the next year learning to fully use all the applications software you could profitably employ.

From a nonprogrammer's standpoint, it does help to know what language the applications software you're considering using is written in. Native code programming generally takes up less space and runs faster. Higher level languages may be easy to transport to different machines. Pascal is a good example. Transportability could be important if you plan to upgrade hardware but want to keep the software you're used to. Programs written in higher level languages will also be easier to customize or modify if that's important to you.

Q: What is branching, and how does it work?

A: Branching is the if-then aspect of computer programs. In computer-aided instruction, repeated failures to get a particular test question right will cause the program to branch—it will go back to review the material on which the question was based, or show the user how to solve the question directly.

Branching occurs at forks in the road, so to speak. If you fire up a word-processing program, you may get a menu asking whether you want to print something, re-edit something, edit something new, or perhaps, reconfigure the program. Depending on your choice, the program branches to your selection. The challenge for programmers is to come up with the branchings that help us most, that fit our optimal work patterns. The temptation is for them to give us branchings that suit pro-

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CIRCLE 12

grammer thinking, which may not fit the application well, or branchings that are easy to code.

Classically, branching involves a Catch-22. Easy-to-learn programs contain numberless branches, asking you what you want to do at every step, if you're really sure that's what you want to do, if you'd like a hot toddy. . .This kind of TLC (Tender Loving Care) is a balm to the computer newcomer's trepidations. But the experienced user wants programs with bold, slashing branches that let him leap from one part to another as his needs direct. He asks that the program keep out of his way more than anything else, and let him focus on his work. That was why he bought a computer in the first place, after all. Some powerful programs are full of helpful branchings with the option of eliminating them as one gains competence. Unless you're sure you'll always be a timid computer user, you'd be well advised to make sure that an easy-to-learn applications program is also easy to live with. Great dates don't always make great mates.

Q: I've heard that Josephson circuits—whatever those are—are going to make grapefruit-sized computers as powerful as a mainframe. Is this coming soon?

A: Nope. IBM and others are researching such devices. They're trying to get around a speed limitation that seems to exist with contemporary technology. Josephson Junction (named after a scientist) circuits have performed as expected in laboratory environments. And they switch in picoseconds (a very small time element) compared to the nanoseconds (one thousand times a picosecond) that are required for circuits built with contemporary technology. But there's a catch. Several, in fact.

Josephson Junctions don't work unless they're superconducting. Superconductivity is a property of matter exhibited by some elements as their temperature nears absolute zero, which is several hundred degrees below zero Farenheit. When an element superconducts, it allows electric current to flow with no resistance. It's as if a garden hose allowed water to flow with no friction between the walls of the hose. Josephson Junctions will act as electronic switches, and their superconductivity also means that signal speeds, which increase as resistance decreases, are very fast. That allows for what the engineers call picosecond electronics.

But, it takes a lot of power to get the circuit to superconducting temperatures, and to keep it there. The bigger the active package, that package that actually does the computing, the more power it takes. So, research engineers are working to get the Josephson devices as small as possible. That has another benefit, by the way. The less distance a signal has to travel, the less time it takes. That makes for even faster electronics. That's good, but there's another problem. It's really hard to make really small integrated circuits. The technology is already to the point that optical photolithographic techniques, on which the semiconductor industry cut its teeth, don't work any more. X-ray lithography is the rage now, and even more sophisticated techniques need to be developed. It isn't likely to happen for a while.

When it does, the net effect of Josephson-based circuit design should be a computer 50 times faster than the fastest mainframes of today, like the Cray-1 and the Control Data 205. But while such a computer's CPU (central processing unit) should indeed be personal-computer sized—it'd have to be to work—the refrigeration equipment won't. Computers based on Josephson Junctions may well replace current mainframes in the foreseeable future. They won't replace personal-computer designs unless you plan to do your computing where it's mighty cool. Pluto might do.

Q: I saw an ad in your magazine for a $900 daisywheel printer. Does this mean I can now get letter-quality printing for half of what it cost up to now, or is there some trick?

A: You refer to the ad for the Smith-Corona printer that started appearing in our February issue. It looks like that company inadvertently advertised the product before it was ready for release. But it should be ready, the company says, by the time you read this, although no product has publicly appeared as this is being written.

Smith-Corona claims its TP-1 printer is inexpensive because the firm invested millions of dollars in simplified design and construction methods for printers, and because it has nearly 80 years in the print-communications business. The printer is also slow, and its specifications are simple. But these qualifications need qualification. At 12 characters per second, the printer is turtle-like compared to a dot-matrix or expensive daisywheel printer. Still, it's a lot faster than you can type. And the slow speed should mean the printer will last for quite a while, since the mechanism is running with comparatively little stress.

Dot-matrix printers like the Epson and Anadex are much faster and very reliable. But they print letters in patterns of dots—obvious dots. They don't print letters that look just like IBM Selectric letters. In emphasized or double-strike modes they get close. Thus far the cheapest candidate for true letter-quality printing is the Smith-Corona.

Some have claimed that only metal daisywheel printheads can match a Selectric's ball for print appearance. Smith-Corona claims its nylon/plastics composite $4.95 head produces letters identical in quality; also that the head compares favorably with those of the competition costing three times as much. The cost of the print head certainly makes it possible to stock a variety of type styles.



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CIRCLE 5

The TP-1 only comes with a friction-feed platen so far. A tractor-feed device for continuous sheet fanfold paper and forms will come later, at an unspecified date. Those still using typewriters will find this a small matter. Those accustomed to tractor-feed printers could find this a painful limitation. However, a firm could have a dot-matrix printer in the $500 to $1000 range for quick output and just use the TP-1 for business communications where appearance counts. In that case, tractor feed would not be so important, since those business communications require bond paper.

One can buy bond paper on continuous-fold, fanfold forms, but it's expensive. Or, a new fanfold bond paper is being sold that has so many tiny perforations along the sides and top that it looks almost as good as single-sheet bond. Again, almost. For those new to this kind of product, tractor-feed paper has rows of holes along each side that mate with the pins of sprockets mounted on the printer. As you feed it into the printer your software and/or hardware senses the end of each $8\frac{1}{2}$ by 11-inch sheet, skipping to the next page. One gets used to this very quickly, so that the prospect of feeding individual sheets of paper into a printer comes to seem indescribably tedious. An alternate solution is a single-sheet feeder. Such things start at double the cost of the TP-1. That's just for the feeder.

One more factor in print quality is carbon ribbons. These are just starting to appear on expensive dot-matrix printers. On daisywheel printers one can usually have the option. For absolute top print quality a carbon ribbon is mandatory. There are other niceties, like underlining, that daisywheels customarily offer, and so does the Smith-Corona. The bottom line is Smith-Corona's overall claim for the machine: that it is a heavy-duty cycle, executive letter-quality printer. If this pans out, maybe the best news for consumers is that if one company can do it, others will.

And then small business and professionals will have a choice for under-$1000 daisywheels. Right now, other than getting a black box adaptor for a used typewriter, the Smith-Corona is the least costly way to do it. In fact, it's almost as cheap as those black boxes by themselves. Pretty tempting, assuming Smith-Corona has done its homework right.

Q: Prices for computers are dropping. Doesn't it make sense to wait to buy for at least a few months more?

A: To see whether you should wait or rush in, you have several external and internal (specific to you) factors to consider. (1) To what extent are prices dropping? (2) To what extent, and in what time frame, are current products becoming obsolete?

So—to what extent are prices dropping? Price drops are both real and illusory. Several manufacturers have recently lowered prices on products. This has generally happened with models that came onto the market when there was less competition. Now new products have made many of these obsolete at their former prices, and their makers hope to get more payback on their research and tooling expenses by dropping the machines' prices to a point where their proven virtues will be appreciated. This is not the same as prices on computers dropping per se, though. It just means that in an area where each year does bring really new models—the old ones are available for less.

New products have been announced at seemingly low prices—$300 for computers intended for home use, to $5000 for so-called business computers. Most such low-cost computers are illusions in search of buyers' something-for-almost-nothing cupidity. That $300 computer isn't such a bargain—if you consider what you'll pay for enough memory to really do anything, and some kind of mass storage. By the time you're done you're looking at around $600 (assuming you use the TV for a monitor).

At the other end, 16-bit microprocessor-driven computers are pushing against the bottom of the minicomputer business. That's a new technology being applied—so it remains to be seen if prices for those computers will go much lower.

With calculators, the prices fell a long way, but finally bottomed out. No matter how large the volume, it costs a finite amount of money to design and build something. It must be sold for a bit more than it costs to make, if the company wants to stay in business. With computers, prices have not been dropping much lately, once you look at the cost of a fully functional system at a given level of technology. There could be another overall drop if computers start selling in the same volume as do video games.

Our second consideration, obsolescence, is another matter. The earliest personal computers were so awkward to use, with things like panel switches instead of a keyboard, that only a hobbyist would want one now. On the other hand, those made since about 1977 are often quite useable, and a sight better than a typewriter, a filing cabinet, the postal service and pencil-and-paper scratchpads. People in our industry start to think a product is obsolete if it doesn't have a 512k RAM, 20 Mbytes of storage and a dozen high-tech features. They forget what adding these devices does to the cost of a personal computer. And they may forget that new, whizbang features may not be able to take advantage of software already designed, debugged and available on older models.

Many industry observers say that software to implement the new hardware is a year or two away—certainly in any real numbers. This can make waiting for new products a real beard-growing experience.

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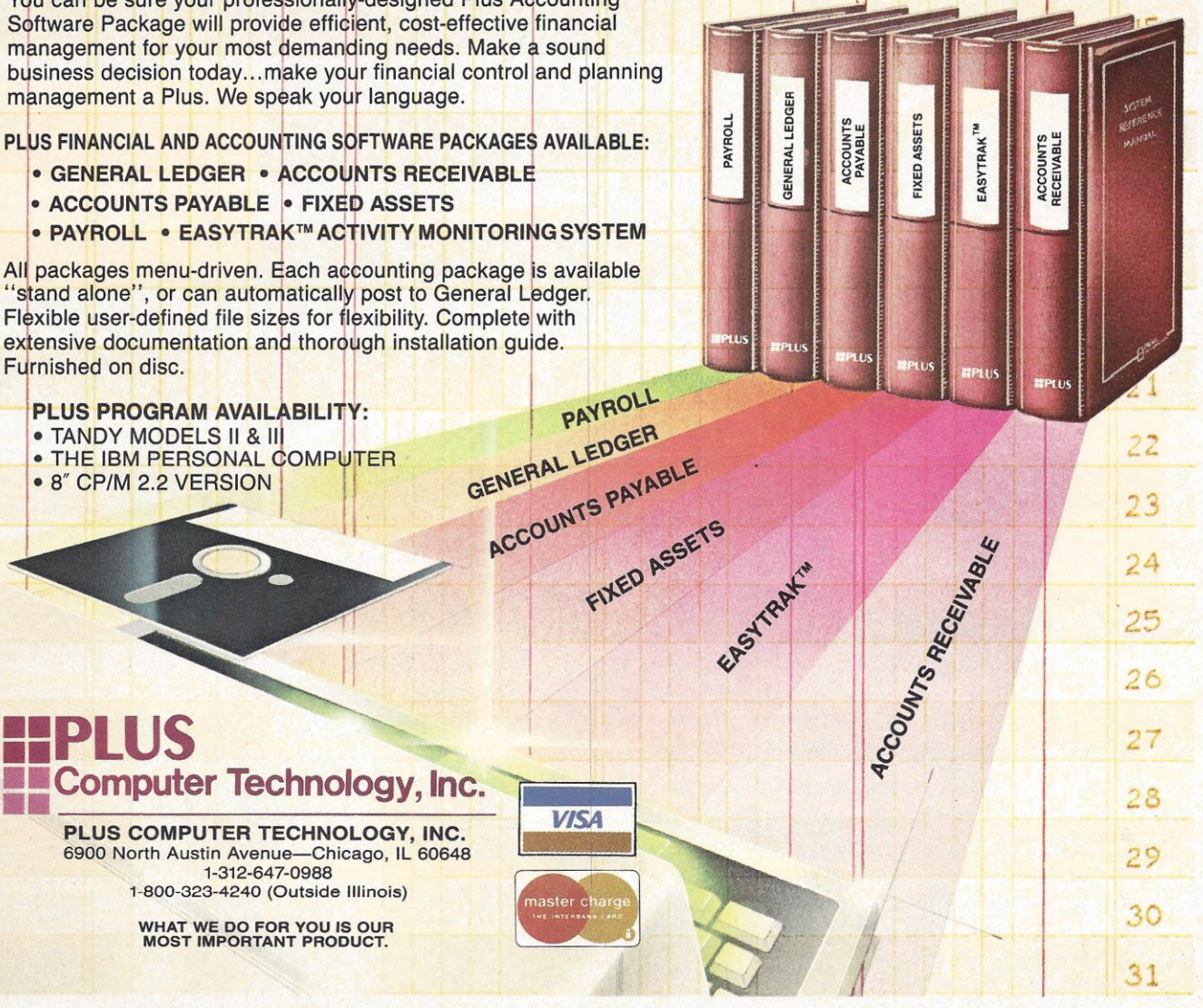
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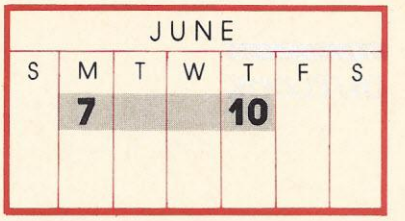
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CIRCLE 16

OUTLOOK



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MEDICS MARVEL AT COMPUTERS

Mt. Sinai Hospital in New York City has always had a reputation for leading the pack, but even Alvin Toffler would have blinked in disbelief at the results of a tiny notice placed several months ago in the institution's employee bulletin. The news item called attention to the inaugural meeting of the Mt. Sinai personal computer users' group, and the turnout (75 staffers) was less significant than the breadth of the response. Physicians, nurses, physical therapists and housekeepers—personal computing aficionados all—bumped shoulders that first evening. "It was truly amazing," says Dr. Steven Rudolph, "I never expected to hear a handyman say, 'Let me tell you about my Sinclair.'"

Rudolph, a neurologist in his early thirties, understands that the marriage of personal computers and medicine means much more than a billing aid. In addition to using a personal computer at the hospital every day ("About 80 percent of my day is spent in research the rest with patients"), Rudolph toils many evenings and weekends as a consultant to scientific/medical users for Synapse Video in Manhattan.

"When I read magazine articles with headlines like 'Putting A Personal Computer in the Laboratory,' I'm usually disappointed," says Rudolph. "The writer generally focuses on some oddball application, or the article is very technical. Likewise, computer-store salespersons don't stress the adaptability of personal computers in the laboratory."

Rudolph allows that much of the software written for lab applications is relatively complicated and expensive, sometimes running as high as $1000 per program. But that's a small price-tag compared to the savings that accrue, he says.

"Suppose it's your task to monitor room temperatures in a large facility," Rudolph hypothesizes. "Let's assume that the existing method is to use a strip-chart recorder, which lists the temperature of that one room on paper. If you're interested in monitoring 16 rooms, that would involve walking to each of the rooms, taking the paper off the machine, and then going somewhere to analyze the data. But if you have a personal computer with an analog-to-digital converter hooked up to each of those thermometers, you can immediately see the data from all 16 rooms. The Easylab data-acquisition program, which is available from the Mia Co. in New Jersey, takes up less than 20k, is written in Apple machine language, and allows the computer to do what I've just outlined: receive 16 channels of information at once and display it graphically.

"The automated-office concept caught on quickly in law and business, but not in medicine," states Rudolph. "But now we're beginning to see more articles on personal computing in medical journals. At a time when grant funds are drying up, personal computers can save the research community a lot of money. And as for general practitioners, the accounting/word-processing software currently available is quite good."

Rudolph is guardedly optimistic about the ever-improving software written to assist doctors in illness diagnosis. "There's not much that's of high quality yet," he maintains, "but a number of companies are working hard to upgrade those programs."

In 1969—while many young Americans were experimenting with drugs—Rudolph began experimenting with the FORTRAN language in pre-med courses at Brooklyn College. His studies there (and later at SUNY Downstate Medical Center) didn't fully prepare him for the fluctuations in trust that occur when one says, "I'm a doctor," and "I'm also a computer consultant." Yet Rudolph feels that the hat-changing can be rewarding and relaxing.

"Sick people are quite often helpless. Sometimes the patients have problems that the doctor can't do anything about, but that seldom stops them from phoning him to convey their worries. It's a very helpless feeling for the physician, too. So when an exasperated computer client calls me and moans, 'My disk drive went out!' I say to myself, 'This is the easiest thing in the world. You just replace a part.' I wish I could help all my paitents as easily."

A THEATRICAL SYSTEM

The movie industry, always in competition with the omnipotent TV set, and now, home video systems, has always tried to keep one step ahead. But how does the theater industry achieve its continuing success despite unpredictable, uncontrollable picture products?

Pleasing the public is the most critical element to the theater circuits' (a chain of theaters city or statewide, or throughout the country) survival. Long queues are frustrating to movie patrons, and tickets can't be bought in advance. In addition, theater circuits have learned that if they're going to be stuck with a box-office bomb, it's better to bail out fast. But with headquarters in New York, San Francisco and other major metropolitan centers, it's too inefficient to call 99 theaters on a daily basis to evaluate critical box-office reports.

Recognizing a need for a more efficient evaluation system, entrepreneurs in Bellevue, Wash., conceived an idea that would revolutionize the theater industry. They adapted a microprocessor-based system that would not only teleprocess revenue reports back to management, but solve the other problems unique to the industry, including inconvenienced customers.

That was in 1976. Four years and two successful working prototypes later, Pacer Corporation was formed, and DATATICKET, a computerized box-office management system, made its debut.

One of DATATICKET's features is that it can sell

tickets in advance of a show—no more hurrying through dinner to get a place in line only to be told the show sold out 20 minutes ago. Theater cashiers can alert moviegoers to low seating by simply checking the house-count feature on the computer.

Theater owners assert that the new technology goes beyond promotion of customer satisfaction. They say that it is also meeting their managerial needs in a cash-only industry. Last year, $2.9 billion passed across ticket counters all over the country, and cash control at theatres hundreds of miles from corporate headquarters can lead to money problems. Industry statistics suggest losses as high as eight percent at box offices, most of which are due to the use of old-fashioned, pre-printed tickets. According to Pacer, DATATICKET's ability to print tickets at the point of sale and store each transaction eliminates auditing, security handling and inventory spot checks.

"We designed DATATICKET after hours of interviews with top circuit executives to find out what management problems they were having," says Paul Monson, president and one of the original partners of Pacer. "Our main objective is to give circuit owners the hardware and software to get the financial-booking data they need to make management decisions."

BREAKING THE TESTING BOTTLENECK

Two years ago, CTS of Berne, Inc., located in Berne, Indiana, depended on pencil, paper and instruments developed in the early 70s for process control. The company, which manufactures resistance modules used in electronic assemblies, employs a production process that includes exacting paint specifications and laser-beam adjustment. One step in the process consists of making connections to each resistor module reading an analog ohm-meter dial and recording the deviation of the reading from specification on paper. All these operations were performed manually.

Well, the process was slow, the test results were not always accurate and labor costs were rising. "We thought there had to be a better way," says CTS engineer Steve Burry. "So we tried to improve our productivity and accuracy." One way that was suggested was to use personal computers.

But CTS management was skeptical that personal computers could remove the testing bottleneck. Burry, too, found there was a lot to learn about the machines. When the engineers finally decided on a 48k Apple II Plus, one disk drive, and a NESTAR network mass-storage system, they thought they would need at least six computers and disk drives to replace the manual method—two was all it took. Finding an interface card that could read the many different connections on CTS's resistor modules was a different story.

The best card for their needs turned out to be the SSM Microcomputer Products A488 Instrument Interface Card. Although the card was designed just 30 miles from Berne, it is now being marketed by the San Jose, Calif.-based SSM. It provides an interface for the Apple onto the IEEE (Institute of Electrical and Electronics Engineers) 488 bus, and sells for $475. The card provided a way of automating the process of getting readings of resistance values onto paper, thus speeding the process over the manual way. The cards boosted testing productivity and relieved any doubts company accountants had about computerizing, Burry says.

"They looked at the pay back and saw that the first step paid for the complete system in six months. Now we don't have much trouble convincing them to expand our computer capabilities," he says. Burry estimates that each system cost between $4000 and $5000, and involved 300 to 500 hours of programming.

But it was worth it. Where test personnel once had to stop everything to write down quality control information, the system allows them to test and record at the same time; a checking process once measured by the minute is now complete in a tenth of a second.

There is a minor drawback, Burry says. To speed testing, CTS would like to compile some BASIC testing programs. But the SSM card needs to know the location of six particular variables. When a programmer declares these variables at the top of an interpreted BASIC program, the SSM card knows their location, which is assigned by Applesoft. But compilers don't put those variables in the same places that the Applesoft interpreter does. "We've tried various ways to relocate those variables," says Burry, "and they just aren't very satisfactory. Now we just run regular BASIC for most applications. Infrequently, when we need more speed, we use some assembly-language programming."

Still, Burry says, he and other company engineers are looking forward to linking their Apples to several production functions like laser-beam etching. And best of all, Burry says, sales for the 1000-employee company have been trending upward for the last six months.

COMPUTERIZING COLLECTIBLES

Stephen Mueller knows that being an art collector involves more than an appreciation of objects d'art. Collectors also need an accurate means of keeping records on the acquisition of rare and/or valuable pieces.

"I collect paintings, antiques and rare coins strictly as a hobby—something I do for my own enjoyment," says Mueller, owner of Mueller Lumber Company in Davenport, Iowa. "Still, when you're collecting valuable items you need to keep records on them, if only for insurance purposes."

Mueller found a good method of keeping records with a combination of an Apple II computer and the PFS



Can you improve excellence?

We can. By adding our Memotech Memopak to the excellence of the ZX81 we have achieved perfection.

The growth of interest in computer use caused by the introduction of the Sinclair ZX81 has made new and exciting demands on the ingenuity of electronic engineers. At Memotech we have focused our attention on the design of inexpensive, reliable memory extensions.

The Memopak is a 64K RAM pack which extends the memory of the ZX81 by a further 56K. The new memory extensions are designed to be within the price range expected by Sinclair users. It plugs directly into the back of the ZX81 and does not inhibit the use of the printer or other add-on boards. There is no need for an additional power supply or leads.

Increase your memory.
The Memopak together with the ZX81 gives a full 64K, which is neither switched nor paged, and is directly addressable. The unit is user transparent and accepts such basic commands as 10 DIM A(9000).

0-8K . . . Sinclair ZX81 ROM
8-16K . . . This section of memory switches in or out in 4K blocks to leave space for memory mapping, holds its contents during cassette loads, allows communication between programs, and can be used to run assembly language routines.
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With the Memopak extension the ZX81 is transformed into a powerful computer, suitable for business, leisure and educational use, at a fraction of the cost of comparable systems.

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CIRCLE 8

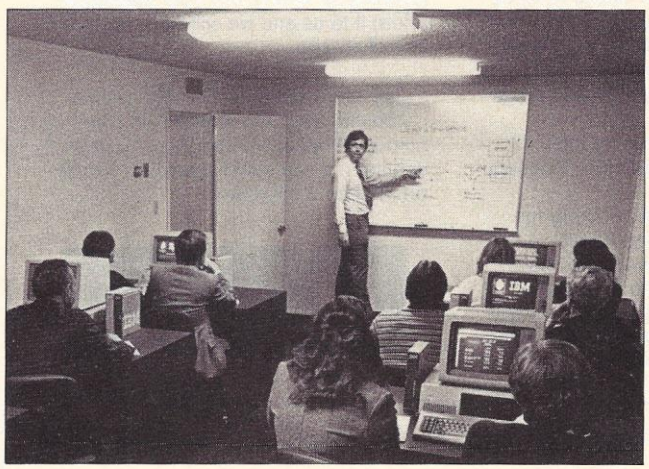
(Personal Filing System) program from Software Publishing Corp. in Mountain View, Calif.

By his own admission, Mueller's record-keeping system before he purchased the computer was slipshod at best, consisting mainly of mental notes and scraps of paper stored in drawers and boxes. When his collection grew so large that he began having trouble locating information on pieces—sometimes even the pieces themselves—he knew a change was in order.

"Using PFS, I sat down and designed a form that identifies each piece by item number, artist, purchase price, insurance value, quantity, location and description," says Mueller. "Now I can locate anything I want to know about a piece in a matter of seconds, just by typing in a number on the computer. It's great."

CLEARING COMPUTER CHOICE CONFUSION

With the explosive growth of the small-business computer, many potential owners and users have become confused by the computer choices confronting them. This is the observation of Tom Palazzo, president of International Computer Training Centers, creators of CompuGuidance computer training programs.



The CompuGuidance training centers are removing the mystery that surrounds the purchase and use of personal computers.

"Buyers cannot communicate their needs effectively to salespeople, and many users are not able to realize the full benefit of existing small-business systems. The missing link in the industry," Palazzo says, "is the lack of formalized training for the buyer or prospective buyer."

Palazzo, a former computer retailer, explains that as the number of potential users increases, so does the number of products available. "As a result, CompuGuidance instructional programs for personal-computer users were created," he says. "The training centers are specifically designed to lift the veil of mystery that surrounds the increasingly significant role of these machines."

The new training programs are divided into two logical five-course phases. The first of these helps the businessman understand the many available options. The first-phase courses consist of: Small Business Computer Solutions to Business Problems, Implementation of Small Business Computers in the Office, Financial Modeling for Business, Word Processing for Business, and Accounting for Small Business Computers.

The second phase of instruction was created to provide specific courses and applications for those who have purchased a computer, or who have made the purchase decision. The courses include: Understanding the Operation of Small Business Computers, Setting Up Your Own Financial Models, Maximizing the Productivity of the Word Processor, Cash Flow Management with Small Business Computers, and Expanding Your Small Business Computer.

Palazzo says that no particular brand of computer is recommended in the courses, although the CompuGuidance training center in Phoenix uses the IBM Personal Computer for instructional purposes. Courseware covers other equipment such as Xerox, Hewlett-Packard, Wang, North Star, Zenith, Altos, Apple, Commodore, Vector Graphic, Radio Shack and Archives.

More information on the centers is available from International Computer Training Centers, 3644 E. McDowell Rd., Suite 208, Phoenix, AZ 85008.

NO MORE SNEAKING AROUND

Employees who have been sneaking their Apple and Radio Shack personal computers into their offices, well out of sight of corporate data-processing and purchasing departments, may soon have nothing to hide. According to a recent user survey conducted by International Resource Development, a market research firm, corporate DP departments in many firms think the machines are such a good idea that they'll soon help buy them for users in the company. As a result, truckloads of these machines may be delivered to company front doors instead of creeping in the back way.

One of the main reasons the corporate DP department is about to get actively involved in personal computer buying is to allow large organizations to take advantage of discounts being offered on multiple-unit sales. "Eighty percent of the DP managers interviewed said that they expect to help develop product-selection criteria and buying policies for the company's future personal-computer purchases," says Steven Weissman of the IRD staff. "It's natural that the firm would try to centralize control of these machines in the department that has expertise with similar types of products."

New personal computer vendors on the scene, such as IBM and Xerox, are offering discounts from five percent to more than 20 percent on volume purchases by large

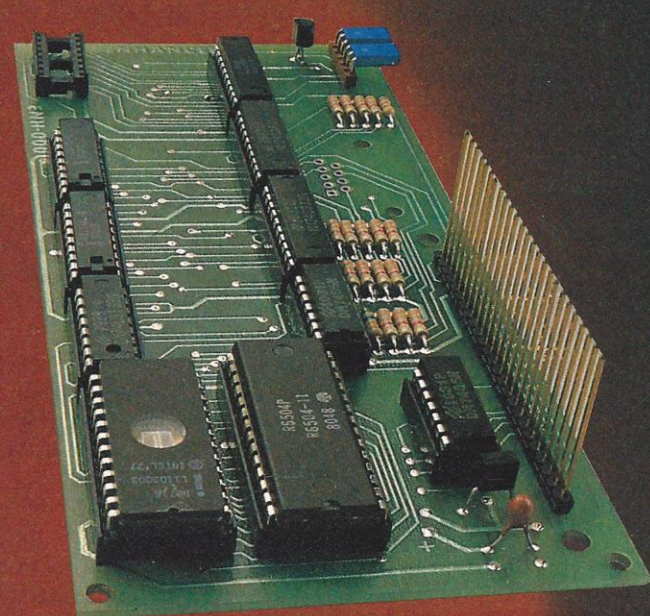
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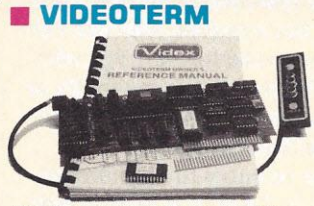
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Suggested retail price: $149.00.



■ VIDEOTERM

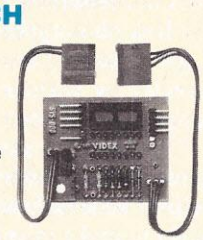


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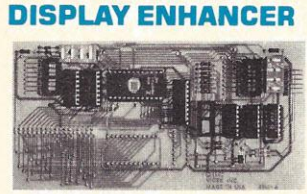
Suggested retail price $345.00

■ SOFT VIDEO SWITCH



The Soft Video Switch is an automatic version of the popular Switchplate. It knows whether it should display 40 or 80 columns or Apple graphics. It does the tedious work of switching video-out signals so you don't have to. The Soft Video Switch can be controlled by software. Any Videoterm with Firmware 2.0 or greater may be used with the Soft Video Switch. The single wire shift mod is also supported. Package price is $35.00.

■ KEYBOARD AND DISPLAY ENHANCER



The original Keyboard and Display Enhancer is still available for Revision 0-6 Apples (on which the new Enhancer II will not fit). These Apples have memory select sockets at chip locations D1, E1 & F1. The Keyboard and Display Enhancer allows entry and display of upper & lower case letters with fully functional shift keys. It does NOT have user definable keys nor a type ahead buffer. The price is $129.00.

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Dvorak EPROM (Enhancer) $29.00

Lower Case Chip $29.00

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organizations. Other suppliers, such as Apple and Radio Shack, are also implementing such programs.

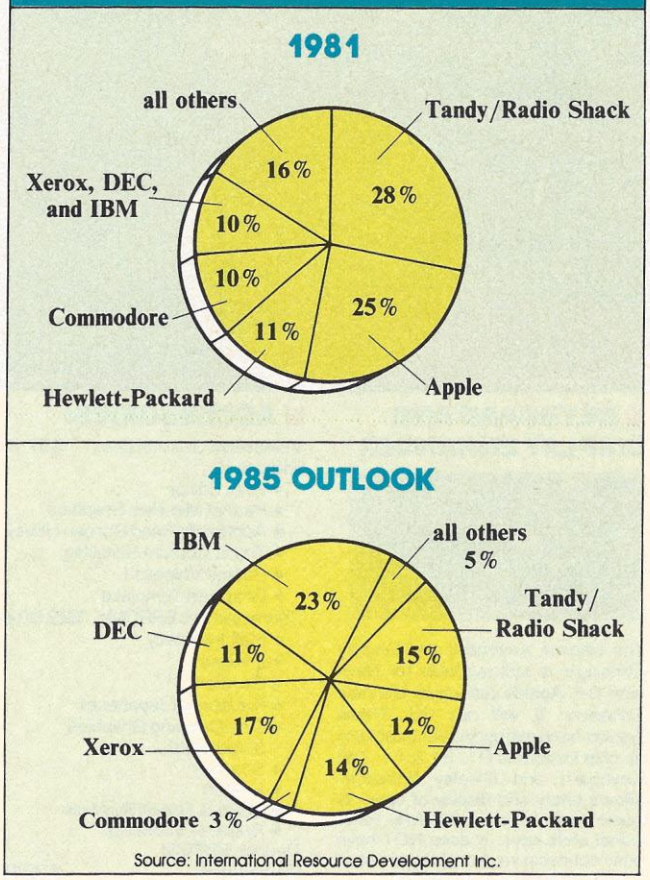
According to the survey, shipments of personal-computer products are forecast to increase from 190,000 in 1982 to 500,000 in 1985, and will continue climbing, passing the one million units level in 1989. Cumulative revenues from the sale of these machines to large organizations during the entire period will be more than $15 billion. This figure does not include the sale of software, add-on peripherals and supplies.

Departments in large organizations that will make the heaviest use of personal computers include engineering, accounting and other financial departments; and planning professionals and department managers are pegged as the primary users of the equipment.

The impact of centralized control on personal computer sales to large companies will be mainly felt in the competitive area where Radio Shack and Apple are currently the market leaders with 28 percent and 25 percent shares, respectively. DP managers will have a tendency to prefer using manufacturers with which they are more familiar and whose direct-sales offices can offer broader based support programs. This will pave the way for major market inroads by IBM, Xerox, DEC and Hewlett-Packard. According to Weissman, the market share will be less for some suppliers such as Commodore, and for many independent computer retailers and dealers who will be unable to offer comparable price cuts.

Further details on the survey report, which is entitled *Microcomputers in Large Organizations,* including a free description and table of contents, are available from IRD at 30 High Street, Norwalk, CT 06851; (800) 243-5008 (in CT or outside the U.S. call (203) 866-6914).

LEADING VENDORS IN LARGE ORGANIZATION MICROCOMPUTER MARKET: MARKET SHARES BASED ON ANNUAL SHIPMENTS



Source: International Resource Development Inc.

COMPUTER-CONTROLLED TYPESETTING

Many people find a career not by design or intention but merely by chance. Charlotte Drake is one such person.

In 1979, to call attention to Parkinson's Syndrome as a major disability, Drake started Parkinson's Educational Program (PEP). Part of this effort included a newsletter called the *PEP Exchange*, which now reaches an audience of 10,000 in 17 countries.

Because Drake was responsible for the group's newsletter, she came in contact with a local typesetting company that uses an Alpha Micro Computer in its operation. "We found its typesetting method very easy," says Drake. "I was able to significantly reduce my newsletter cost and I discovered I liked the typesetting business." Today she is a partner in the business, now called Specialized Data Products (SDP).

The company provides computer-assisted phototypesetting with its Alpha Micro Computer, which controls a $24,000 Itek Quadritek 1210 phototypesetter with a microprocessor and a sophisticated typesetting software program.

With the Alpha Micro-based typesetting system, SDP does not require a typographer but someone who can run the Itek phototypesetter and knows the formatting codes. Copy is entered into the Alpha Micro system manually or directly by various electronic means. It is coded in the computer and then run through the Quadritek.

"This process saves expensive re-entry time and eliminates re-entry errors," Drake says. "And it is particularly helpful with technical material. A typesetter may be more likely to make mistakes just because he's not familiar with the subject. It also allows us to be much faster than other typesetters. We can often provide typeset copy in as little as two hours.

"With our equipment we're able to do, at a fraction of the cost, what major publishing houses do," Drake says. "SDP customers are generally Alpha Micro users who

(continued on page 156)

Introducing the Most Powerful Hand-Held Computer System Ever!

Radio Shack's New TRS-80® Pocket Computer PC-2 And Printer/Plotter/Interface



Another Innovation Joins the TRS-80 Family —the Broadest Line of Microcomputers in the World

Radio Shack Introduces a New Dimension in Personal Computers: 2 1/16 × 12 7/8 × 4 1/2" —*and that includes the printer!* The new TRS-80 Pocket Computer Model PC-2 puts powerful computing features in the hands of engineers, students, businessmen, professionals—anyone with problems to solve on-the-go.

Easy to Program. The PC-2 uses a powerful Extended BASIC language that permits program applications never before possible on a computer of this size.

Loaded with Deluxe Features! The 26-character Liquid Crystal Display produces upper and lower case characters, plus its 156 × 7 dot matrix is fully graphics programmable. Also included are 2640 bytes of user memory (retained when power is off), a 65-key keyboard, 10-key numeric pad, a real time quartz clock, even a programmable beeper! Powered by 4 "AA" batteries (not included). PC-2, Cat. No. 26-3601.

Expand with 4-Color Printing and Cassette Storage. The PC-2 Printer/Plotter and Dual Cassette Interface (Cat. No. 26-3605) makes it easy to plot superbly-detailed X/Y/Z graphics. Both upper and lower case characters can be printed in nine different sizes. (Available in June.)

Dual Cassette Operation. Use two recorders to store and load PC-2 programs and data. Data can be read from one cassette, updated, and stored on a second cassette under program control—*automatically!*

Ready to Use. Just slip your PC-2 into the Printer/Cassette Interface. Its built-in rechargeable batteries also power the PC-2. Includes charger.



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CIRCLE 10

A PERSONAL COMPUTING Interview With Ben Rosen

When Ben Rosen, the subject of this month's interview, speaks, people listen. President of Rosen Research, a New York firm that watches and reports on high-technology industries, particularly personal computers and semiconductors, Rosen is in a perfect position to call the future of personal computing in this country, and indeed the world.

Rosen was one of the people, in fact, who clearly foresaw several years ago the impact that personal computers and personal computing would have on the world. Since that time his prognostications have been right more often than not, and thus he's privy to more inside information about the companies in the personal-computing industry than most of us knew was available.

We thought it would be instructive and refreshing to talk to someone who has his finger exactly on the pulse of the industry that serves us all. So Personal Computing *trudged into Rosen's midtown Manhattan office one gray, early spring day to try to find out what industry watchers say is moving and shaking the world of personal computing.*

We weren't disappointed by the visit, since we found Rosen a delightful person, full of wit as well as the expected industry knowledge. His insights should help us understand, at least a little better, the future direction of this phenomenon we call personal computing.

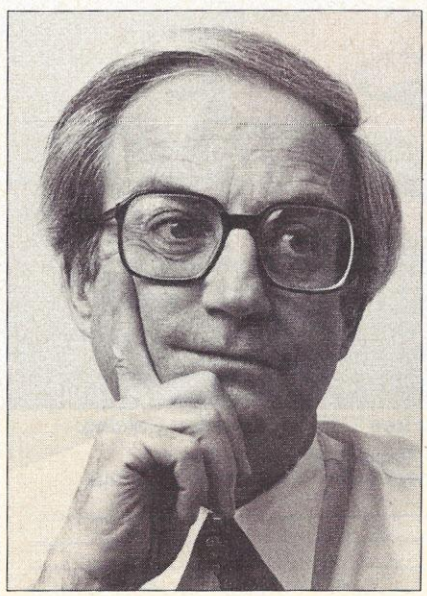
PERSONAL COMPUTING: What is the future of the personal-computing industry?

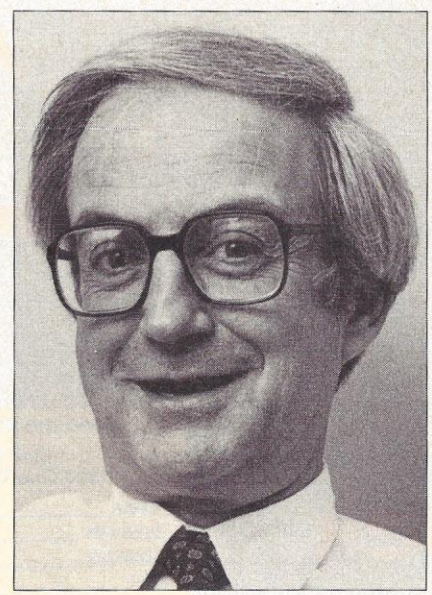
Rosen: Sometime in the late 1990s the personal-computer industry will be the largest part of the computer industry. It will eclipse the mainframe industry. I believe that forecast. The mainframe industry is saturated; it's a replacement market now. Every insurance company that ever wanted to have a computer has one. Every small business that wanted to have a computer doesn't. Most professionals don't have one. Certainly most homes don't have one. You have very small penetration in the personal-computer market and you have saturation in the mainframe market.

Another trend is where the best and the brightest people are going. Where does the talented computer scientist go nowadays? Does he go work for a mainframe company? Does he go work for a minicomputer company? They're all gravitating toward the personal-computer companies. That's where the action is, and that's why I think the innovation—the *real* innovation in the whole data-processing field henceforth—is going to come at the low end. It's where the center of gravity of the industry is now, technologically and in terms of growth. So it has come a long way in seven years.

PERSONAL COMPUTING: What will this industry do for this country?

Rosen: That's another thing. There is a lot of *mea culpa* in America about how we've screwed up this industry or that. And we have this inferiority







complex with the Japanese. But here is yet another industry which we pioneered and which we dominate. And in this case I think we are going to continue to dominate it for a long time to come.

PERSONAL COMPUTING: Is it because of the innovation required to keep it fueled?

Rosen: That's one of the reasons. We thrive very well in industries where the entrepreneurial spirit is important, where there is constant innovation, where software is important, where there is a sensitivity to the marketplace. What do people want? We quickly implement those needs in terms of products. We're very good at that.

PERSONAL COMPUTING: Some people would say that's because we are undisciplined. We don't take the time to stick it out with a product; rather, we try for something new all the time.

Rosen: I think we do what the market tells us to do. The market tells us we want something new so we do something new.

PERSONAL COMPUTING: Is the market telling us to go to 16-bit computers?

Rosen: I think there is good reason for 16-bit personal computers. Right now the personal-computer market is relatively sophisticated. But for computers to fully exploit their potential and become as ubiquitous as the television set or the refrigerator, the interface has to be simpler. You need more processing power in a computer to cater to a less sophisticated use. The fact that the computer is more powerful is discerned by the user in its ease of use. One such computer is the Xerox Star, which is indicative of exactly the way I think personal-computer technology is going.

The Star uses very high-resolution graphics, very advanced software, and a tremendous amount of processing power. It uses a new interface device, the Mouse, that lets it bypass the keyboard. It's a ball-bearing type of controller on a flat surface that moves a cursor on a screen. So you simply point to the menus or the forms or the icons on the screen. All of a sudden it becomes very easy for someone to use it. You don't need instruction books.

Most people in their adult lives have never read a book, and we're trying to put a machine in their homes that has a keyboard and has all sorts of tricky commands. That won't penetrate the mass market. You must make it very, very simple.

And the way to do something very simple is to get very powerful hardware and software inside. The only way you are going to change some of these simple interfaces is by complex innards. So with a 16-bit processor, instead of addressing 64 kbytes of memory, you go up to one megabyte. And you can do some very powerful graphics now with a 16-bit processor which was difficult or impossible with an 8-bit. It's easier for people to interface with graphics than with messages on the screen that say "press this key," or "do this or that."

PERSONAL COMPUTING: A picture is worth a thousand words?

Rosen: Yes. I couldn't have said it better myself.

PERSONAL COMPUTING: So what does all this mean?

Rosen: The market for 16-bit computers is going to be broader than that for 8-bit because it is going to allow new interfaces, which will permit a less sophisticated user to use them. They'll go down from the professional level, let's say, to the clerical and secretarial level in business, industry, and even in the home. In a few years you're going to see 16-bit computers that are much less formidable than 8-bit computers.

PERSONAL COMPUTING: Will these still be personal computers?

Rosen: If "personal computer" is defined as one person, one computer, yes, very much so.

PERSONAL COMPUTING: Is it fair to say that skilled office workers, as opposed to managers, do not have much to do with personal computers now?

Rosen: Right. The penetration of the potential market is extremely small right now.

PERSONAL COMPUTING: Will we see the skilled information worker becoming involved in personal computing more and more?

Rosen: Yes. And to go even beyond that, even the people with lesser skills will be able to use the machines much more easily because of this extra processing power.

PERSONAL COMPUTING: So the power is making the machine more "user-friendly?"

Rosen: Absolutely. Everything we've seen up until now in personal computers has been a downsizing of computers into a smaller and cheaper form. There really hasn't been anything different in the form of architecture, in the form of display, in the form of user interface. They are just making bigger computers smaller and cheaper. Clearly there is a very large market for that.

But I think that what we are going to see starting next year are the first radical changes in computer technology in a long time. And they'll start from the personal computer level. There will be changes in graphics, in software, and in the user interface. I think there's going to be almost a step function difference in the industry's growth because of that.

PERSONAL COMPUTING: The industry has grown pretty phenomenally already.

Rosen: Yes, but it has grown by tapping the hobbyist and then the sophisticated professional and the business people who are the early achievers in their groups—those who recognize a good thing early, and are willing to pioneer. But we're talking about 2 million personal computers that have been sold. How do you go to 100 million? Where do those 98 million users come from?

The answer is they will start using computers and will fulfill latent needs that they have very simply. Otherwise they will continue filling

those needs through conventional means.

PERSONAL COMPUTING: How do you see this penetration happening?

Rosen: There are several aspects to this penetration. Make the machines friendlier. Make them less expensive. Make them fill some latent need that the person has.

Now the biggest potential market is the home market. And here is where it's hardest to define what that latent need is. A lot of people bought home computers for entertainment, for education to some extent. These are the up-scale consumers. But how do you go from that up-scale person to the mass market? You've got to fulfill those latent needs. I don't know whether those latent needs are courseware instruction in the home for the children, the delivery of remote services, information services, the ability to conduct transactions remotely through your computer, entertainment or some other useful functions. I don't think that "grabber" program, a program for the home like VisiCalc for the professional, has been defined yet. But I think it will come.

PERSONAL COMPUTING: What do you think is the real attraction of a personal computer?

Rosen: In the professional market it's productivity. In the home market the attractions now are really just computer literacy and entertainment.

PERSONAL COMPUTING: How do you define computer literacy?

Rosen: Computer literacy is simply using computers to learn some programming, and to learn what a computer is.

PERSONAL COMPUTING: Is it a necessity today to have it?

Rosen: No, I don't think so.

PERSONAL COMPUTING: Will it be in the near future?

Rosen: Probably.

PERSONAL COMPUTING: Is it fair to say that the vast majority of the people in this country will have to know how to use a computer?

Rosen: Yes they will, but I think that by that time the interfaces are going to be so simple that you won't have to know anything more about a computer or programming than an automobile driver has to know how to tune an engine or how an automobile works.

PERSONAL COMPUTING: It's going to come that fast, in the next 10 years?

Rosen: Yes.

PERSONAL COMPUTING: Besides the Mouse, what other kinds of interfaces are going to help people to get over this "easy-to-use" barrier?

Rosen: I think there is a gradual trend toward making application software easier to use. You can't sell it to a mass market if you have to read a 200 page manual to use a program. You have to have software that is "instruction-book free." You have to be easily prompted on the screen. No one reads instruction books at all on anything they buy anyway. Then you have new interfaces, such as the Mouse, coming along where you can bypass the keyboard.

And then I think of the 1990s. Speaker-independent voice recognition will approach cost levels that are low enough to make it practical for low-cost computers. And there you simply have voice recognition and voice synthesis as the principal in-house device of the computer.

PERSONAL COMPUTING: So by sometime in the 1990s you see the personal computer without a keyboard?

Rosen: I see the keyboard not being used very much. It might be used as a backup in case there is some esoteric word not in the computer's vocabulary. But I don't think that's near term. Speaker-independent voice recognition is still difficult to achieve in a low-cost product.

PERSONAL COMPUTING: Is that because it takes too much memory right now?

Rosen: Well, lots of memory and lots of processing power.

PERSONAL COMPUTING: More than 16-bits of power?

Rosen: Yes, for any kind of large vocabulary that's truly speaker independent. You don't want to have to train your computer for 20,000 different words. You don't want it to recognize 98 percent of the words. Or the same word 98 percent of the time.

PERSONAL COMPUTING: You have an Osborne sitting here. It's a portable personal computer. Should all personal computers be portable?

Rosen: I think portability is a very attractive feature of the computer for both the office and home environment. It's not necessary and it may not be ubiquitous, but I think its going to be a very important part of the market.

I think that Osborne really discovered something—touched a nerve in the market and that was the desire for portability, particularly among professionals who do some work at home and some work at the office. Osborne's company has had the fastest growth of maybe any company in American history. At least, the fastest of any I've heard of, and I've tried to research the subject. I don't know of any company that has gone from almost zero to, I don't know, a 150, maybe more, million dollars in its first full year of production. Portability is part of it, low cost is the other feature.

The low cost is more important in the success of the Osborne than portability, but portability is also important. Categorically, you're going to see a lot more portables a year from now than you see now. There is an analogy here. The first calculators were all desk calculators. The handheld calculator took over quickly, so that probably 98 percent of all calculators sold today are hand-held.

But the small form factor is a very desirable feature. You don't need that bulk. It costs more. It takes up more space on your desk. It's not necessary.

PERSONAL COMPUTING: It uses more power, too.

(continued on page 98)

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Electronic Mail Delivers The Executive Message

With electronic mail via personal computers on the threshold of entering the executive mainstream, message sending across corporate America may never be the same

by Jeffrey Rothfeder

In the last century the pony express set the tone and since then the business of mail in this country has not really changed. It may not be carried overland on horseback anymore, but mail is still hauled—now by rail or plane or truck—then it's sorted and batched; then delivered. By now this has become a familiar, if sometimes unsatisfactory, way to correspond with others. But after more than a hundred years, the concept of mail—and the way it is disseminated—is on the verge of being reshaped and redefined by the nation's thirst for more information at faster speeds. Electronic mail, its movers and shakers contend, is about to make people finally forget the pony express.

To some of its hardier proponents, electronic mail is a fundamentally necessary business tool of this era, one that will accelerate office efficiency and limit paperwork while it alters—they claim in a positive way—the way we communicate. Others disagree and say that it will never truly replace the common letter. But whichever view is correct, it is clear that the printed letter will have to share its domain with messages transmitted between computers.

Electronic mail is a slippery term, carrying a number of definitions under its wing. In general, though, it is correspondence that people transmit and receive over computer lines. The correspondence can be one-word messages or 10-page letters; they can be mail that is interoffice, intraoffice, office to household, or ultimately, delivered by the postal service. The message can be sent to 100 different addresses per mailing or it can be destined for only one.

Beyond the way the mail looks physically, equally diverse is the way it is transmitted. The computers can exchange the messages over wired local networks or via telephone lines using modems—and they can be driven by a wide array of software.

In a market that is just beginning to emerge—and one that is so varied—predictions as to how large the field will become are just that: predictions. But many forecasts—and these are considered extremely rosy—claim that more than 1 billion messages a year will be mailed electronically by 1990. The market is projected to generate over $5 billion in yearly equipment sales by that time.

Currently, much of the burden of electronic-message sending is being carried by mainframe computers, but the expectation that personal computers will soon become a major force in this market is clearly one of the significant factors buoying the prospects of electronic mail.

"Electronic mail on personal computers will before long be a fixture in executive offices," says Nancy Beckman, a marketing assistant for The Source's flourishing electronic-mail program. "When it's not uncommon for a businessman to be carrying a briefcase in one hand and a portable computer in the other, then this threshold will have been crossed."

Jeff Rothfeder, our associate editor, writes about major issues in this industry.

Good times ahead

Officials of The Source have first-hand knowledge of the bright future awaiting electronic mail. The McLean, Va., data bank has an electronic postal system called Source Mail, which has become—somewhat to the surprise of the company's officials—the firm's biggest money-maker. Source Mail is currently processing more than 20,000 messages a month.

The reason for this hefty volume is simple, according to Beckman. "The numbers are right," she says. "A businessman sees that he can send 2000 letters in 35 minutes over our system. The decision to use electronic mail is almost made for him when he realizes a combination of things: one, that he presently spends a large portion of his day talking about trivial items on the phone; two, that electronic mail is just as immediate as a phone call; and three, that with electronic mail he doesn't have to deal with phone etiquette."

For Source Mail, the firm's central data bank plays the same role as the general-delivery boxes at the post office. Separate "cubbyholes," each with a different access code, are set aside for individual Source subscribers.

A subscriber who wants to send a letter first calls up The Source with his personal computer using a modem, then he types MAIL SEND,

"Electronic mail, its movers and shakers contend, is about to make people forget the pony express."



Illustration by Greg Brown

"Many forecasts claim that more than 1 billion messages a year will be mailed electronically by 1990."

the receiver's identification number, the subject of the correspondence and then the message. All this is put into the receiver's mail slot until he calls up The Source to retrieve his messages.

The variations on the Source Mail theme are wide. A writer can send the same note to multiple addresses or stipulate that it can only be read by a person with a special access password; he can send a message that is specified to be held for delivery until a certain date or he can send it express; and he can call up a program that will correct spelling errors in the message before it is sent.

Joseph Koeningstein, a Philadelphia architect, began using Source Mail last November as a way to break a communications logjam he was having with the Navy. As a longtime buildings designer for the Defense Department, Koeningstein for years had been receiving the 1000-page Pentagon specifications volumes through regular mail. But after they arrived in the mail, he and his staff began the rigorous job of editing the new specifications into his already developed buildings plans, and then retyping them.

"The best solution would have been to have the Navy send the material directly to my computer system, and we could have edited it there," Koeningstein says, "but the Navy's Wang computers could not send the manuscripts to my PET computer. The two simply speak different languages."

Thus, in effect, Source Mail became a translator between the two computers. An agreement was worked out whereby the Navy began to send the specification volumes to Koeningstein's postal box at The Source. Koeningstein retrieved the information and put it directly onto his Commodore's screen so it could be edited into the buildings plans. Editing time was greatly reduced, and storage as well as organization of the Navy's specifications were improved immeasurably because he was able to file the data directly onto disks.

"Using Source Mail changed our disadvantage into a distinct improvement," Koeningstein says. "Before we used it, working with the Navy was costing us a lot of money in office time just in dealing with the specifications as they arrived. We were also at a disadvantage because we couldn't afford the $10,000 to buy a Wang computer that could accept mail from the Navy's computers. Source Mail turned our smaller Commodore system into one that can communicate with the Navy's, and, in the process, cut our costs and made our operation that much more efficient."

Some limitations

The major disadvantage of electronic mail at The Source is that only subscribers can write to each other. This factor apparently is not dissuading small businessmen from using the system, but it is perceived as a limitation by some larger firms. Businesses that have far-flung corporate networks or the need to move information swiftly between departments in the same building have begun to develop far more sophisticated systems that can provide them with greater communications ability.

Many of these corporations have for a long time looked only to their centralized mainframes to handle the electronic shuffling of mail. But with more and more personal computers now perched on executives' desks, using these machines for electronic mail has unexpectedly emerged as a natural by-product in the largest of companies.

Take the case of the BDM Corp., a large, high-technology consultancy, based in McLean, Va., that has the Defense Department as a client. About a year and a half ago, the firm was committed to using its newly purchased Apple computers primarily for in-house office procedures such as creating projection charts and budgeting; electronic mail was never considered to be a part of BDM's overall personal-computing picture. But this changed when, soon after, BDM wired its offices with Omninet, a local network from Corvus (San Jose, Calif.), in an attempt to increase the potency of its Apples. With the local network in place and the personal computers now wired to speak to each other, electronic mail on the Apples became an inevitable offshoot.

"Omninet was first looked at primarily as a means of adding to the hard-disk capacity of the Apples," says Kevin Apsley, an associate staff member at BDM. "But electronic mail, we found out, was a natural extension of that new capacity."

The circuitous route that BDM took before deciding to use its personal computers for electronic mail is not atypical. An Omninet product manager says he sees this kind of roundabout corporate decision-making all the time.

"Electronic mail is simply not a reason to buy a local-area network," Corvus' Ray Mausling says. "The reason to buy it is to share expensive peripherals. But once you have a network in place, then it suddenly makes sense to get involved in electronic mail."

Channeling through

When electronic mail is channeled through a local-area network, a hard disk, one of the peripherals wired into the system, becomes the maildrop with the same "cubbyhole" system as Source Mail uses. A person in the firm enters a message on his computer, a list of people who should receive it, the time it should be sent, etc., and sends it to this central disk. The letter is sorted and stored there until the receiving party uses a code to access his maildrop slot.

BDM, which has 1000 employees in the Washington, D.C., area and 2000 internationally, developed its electronic-mail system from scratch

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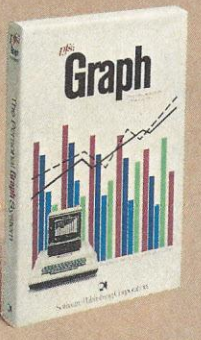
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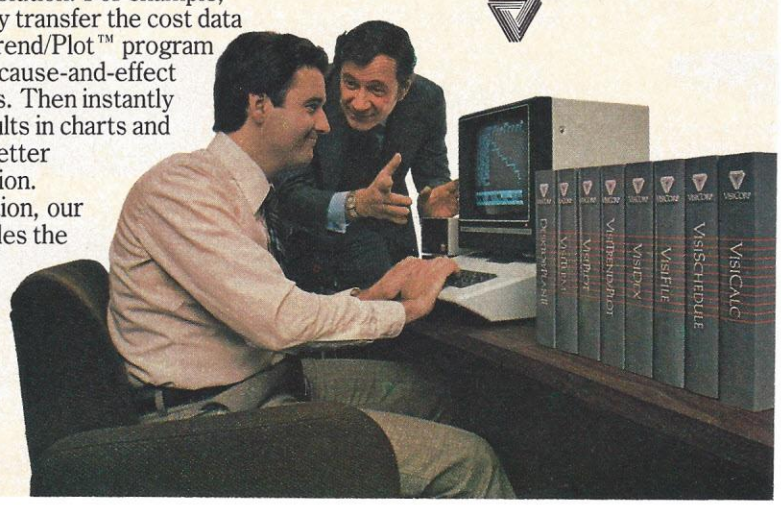
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"It may not be the end of the written word, but this communication will revolutionize our concept of business letters."

with in-house technical expertise and some support from the Corvus Omninet group. Apsley says that the system took about three months to set up and estimates that it cost about $5000 in programming time. At BDM, the same hard disk that serves as the central post office is also able to store graphics as well as information about the company's current research in videodisk technology.

The consultancy recently parlayed its electronic-mail experience into a contract with the Defense Department to direct the assembly of an electronic-mail system to link Army command posts. The system will be based on the same Omninet network, and will use Apple IIs.

"There was a lot of paperwork and paper message sending between command posts that can now be put on the computers," says Apsley.

What a relief

It is this relief from the burden of the paper chase that is cited as the greatest benefit of electronic mail by those executives who have converted to it. They also say that it gives them the freedom to choose the most appropriate form of communication. When the intimacy of a phone call is proper, it can be used; but if either a short message or something longer and in writing is called for, electronic mail serves the purpose.

"I still spend as much time on the phone as I ever did," says Lee Milovich, a manager at Atari Corp. who helped develop an intra-corporate electronic-mail system for the computer firm. "But now if I need to send or receive something more structured—less rambling than a phone conversation—the electronic-mail approach is ideal."

The system used by Atari is called Infoplex, and is marketed by CompuServe, a personal-computing data bank that is The Source's main competitor. Unlike Source Mail, Infoplex is not purely a subscriber's mail drop; it is an in-place network developed

HOW TO GET STARTED IN ELECTROINIC MAIL

It's clear that electronic mail—or at least electronic communications—is a growing service. How can you get in on the action?

The first thing you need is a computer. Any computer will do, but most people will, no doubt, opt for a personal computer. More and more, electronic mail will become a very useful desktop application of personal computing.

Next, a modem is required. A modem is a device that takes electronic codes suitable for computer comprehension and turns them into signals that can be transmitted over the telephone.

There are several kinds of modems, and they operate at different speeds and in different ways. Direct-connect modems hook the computer into the telephone network electronically, while acoustic modems make the connection through the air, with the modem generating tones that are picked up by the mouthpiece of a telephone handset. There are advantages and disadvantages to each of these types, but the principal advantage of the direct-connect over the acoustic is that the direct-connect modem is much more noise-free.

Acoustic modems probably shouldn't be used at speeds greater than 300 baud. While most direct-connect models also handle 300 baud, there are some made expressly for personal computers that can carry transmission speeds of 1200 baud. (A baud is a variable unit of transmission speed. For our purposes, it can be taken to be synonomous with bits per second, except when the transmission equipment uses esoteric modulation schemes, which almost never happens with personal computers.) Some direct-connect modems, called card modems, plug into a card slot on the backplane of the computer. Others use an RS-232-C port, and connect to the port. (Of course, a card that provides the RS-232-C port may plug into the backplane of the computer. Or the computer may contain a standard RS-232-C port.)

A visit to your local computer store could expose you to more information than you ever wanted to know about modems. Just make sure the one you buy works on your computer, because modems are expensive (they can cost several hundred dollars).

Next on the shopping list is terminal software. Most such software available today has no provisions for what could be called "true" electronic-mail features. An exception is Micro-Courier, claims its publisher Microcom (Boston, Mass.), citing the program's ability to notify a user of undeliverable electronic mail. This program, and the others available, will turn your personal computer into an intelligent terminal that will act like the terminals hooked onto mainframes. Such terminals use communications protocols to transmit and receive ASCII code over the phone lines, and that's what your computer will do when it emulates a terminal.

Finally, the easiest way to cash in on electronic-mail is to subscribe to one of the data banks such as The Source or CompuServe. These information utilities provide electronic-mail services, among others, to their subscribers. Your computer dealer sells these services.

Artie Maslow, owner of Computer Universe, (Paramus, N.J.), describes the procedure for getting The Source, which he carries.

"We collect a $100 deposit from the subscriber, who gives us a credit-card number to which he wants his charges billed. We call The Source and give them that information. The Source issues a security code and password to the subscriber, and we record that information in his handbook."

The handbook, which is issued by your computer dealer, contains instructions for logging on and off The Source, local-access telephone numbers—everything you need to know to get started in electronic-mail mania.

ELECTRONIC MAIL: SOME CASE HISTORIES

Electronic mail using the personal computer is on its way to gaining a prime foothold in a wide cross-section of the nation's business community. From Fortune 500 firms to successful entrepreneurs, this fast-speed form of communication is being embraced as yet another catalyst in the present-day fervor for increased efficiency.

Most businessmen who are already sending messages electronically say that electronic mail's greatest asset is its pliability. Because there are numerous ways to use electronic mail, most corporations and small businesses are able to tailor it to their needs, while avoiding a massive in-house restructuring to fit the demands of the new system. Some case histories follow.

Dave Hughes is a sort of renaissance man out of Colorado Springs, Colo., who carries personal computers and now electronic mail wherever his talents wander. He has, over the past couple of years, led "roundtable discussions" over Source Mail on such topics as "what will Christmas be like in the year 2000 in an informational society."

In addition, Hughes is currently leading a course at Colorado Tech, which he teaches over Source Mail. Twelve electronic mailers have signed up for the class—including the Lt. Governor of Alaska, Red Boucher. The course is called Electronic English and covers the rudiments as well as the poetry and communications styles involved in using the written word on a terminal screen. By prearranged scheduling, Hughes holds workshops and one-on-one discussions with his Source Mail students.

But despite his thirst to take electronic mail and stretch it into educational and social realms, Hughes also believes that message sending on the personal computer will spur small-business development in a fundamental way. Hughes is presently directing the redevelopment of Old Colorado City, a tucked-away corner of Colorado Springs, with a mixture of old-time flavor and modern mercantilism. With his TRS-80 computer (he also has an Osborne 1) and Source Mail, he constantly sends information, questions and memos out to other redevelopers for input and criticism about his plans. The result, he says, is that he receives replies quickly and in a concisely written style.

"And this is just the beginning for small businesses," Hughes says. "Using electronic mail you can be out West and send a VisiCalc template back and forth and correspond with your hot-shot accountant in New York. And small businesses that could not previously afford strong business associations will be able to communicate over electronic mail using the personal computer with far-flung networks of companies at a reasonable cost, so they'll be more organized than they have been in the past.

"One hundred years ago in Colorado, the Colt 44 was the great equalizer. Now, with electronic-mail possibilities, the Osborne 1 is."

Larger businesses, though, are apparently not ready to give their smaller sisters a monopoly on electronic mail. RKO Networks, which provides news and public-affairs programming to over 300 radio stations across the country, first hooked into Source Mail in 1979. Such information as scheduling changes, program notes, talk-show biographies and a weekly bulletin is regularly sent to electronic "postal boxes" reserved for the affiliates at The Source.

To many of RKO's affiliates, electronic mail is something of a godsend—and a free one, at that. For its stations located in the top 100 advertising markets, RKO provides portable computers from Texas Instruments at no cost, ties them into The Source, and pays the bills on the electronic-mail account. The stations are, thus, given immediate programming information as well as a way to communicate quickly with the network's central offices in New York—with no financial outlay of their own.

The parent firm, of course, also gains from this arrangement. Because of the two-way communication that has developed, Source Mail allows RKO to keep on top of the needs of the affiliates—a good selling point that makes the network an attractive alternative to other small stations shopping for a parent. Moreover, the electronic-mail system assures officials at the home office that their messages are being received and heeded by the stations in the field.

"If it is important enough," says Ken Harris, director of affiliates at the RKO network, "when we log the message in, we can type in Reply Requested. That way we can be sure that we will get an answer to our message, if one is necessary. Also, by typing in Reply Requested, we can be sure that the affiliate station has read the correspondence, because once it goes to retrieve the message, it will not be able to sign off Source Mail without replying to it."

Not every firm is using electronic mail as extensively as RKO, but even those that are just testing its waters have found that its contribution to corporate savings can often be telling. Merck, Sharpe and Dohme, the pharmaceutical giant, is sending mailings electronically in only "one small piece of its operation," as a company official put it, but still the amount of money saved on phone costs has been encouraging.

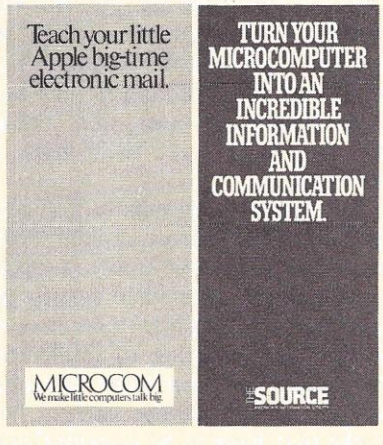
At Merck, as with other firms, electronic mail came as a secondary application of personal computers. The firm's chain of service representatives, who assist physicians in linking up with personal-computer medical data banks such as Medline, have been using Texas Instruments portable computers on the road for close to two years. A little over a year ago, though, it became apparent to company officals that the avalanche of phone calls between these service representatives in the field and their supervisors at the home office in West Point, Pa., could be at least slackened if some of the messages and information were sent via Source Mail.

The plan achieved the desired results. Currently, more than 20 field representatives are hooked into two-way communication with their managers at West Point. While exact figures of telephone savings are not available, Merck officials say that electronic mail has clearly paid for itself.

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CIRCLE 38

"Electronic mailing on the personal computer is about to come out of the shadows imposed by mainframes."

specifically for an individual corporation's message-sending needs. Access codes, stylization of documents to be transmitted and the like are tailored to the client firm. The system is similar to The Source's, though, in that the CompuServe data bank is the keeper of the messages.

Originally, last year, Atari turned to Infoplex as a way for sales representatives to submit orders electronically over Atari 800 computers. But this limited vision of the value of electronic mail did not last long. Company executives began to rely on it more and more for sending memos when they saw how well it worked for the company's salesmen. Today, the system is used for virtually nothing but letters, according to Milovich. Atari's electronic-mail network extends from corporate headquarters in San Jose, Calif., to the firm's 30 branch offices nationwide.

Milovich says that once an executive gets used to electronic mail, checking for messages becomes just another ritual of the day. "I dial up first thing in the morning to see if anybody has left me a memo from the East Coast," he says. "Then I usually check in again at noon, and then twice more in the afternoon."

But not everybody is as enamored of electronic mail via personal computers as Milovich and his colleagues.

Proponents aren't swayed

Steve Morse, who is responsible for implementing the use of personal computers at Manufacturer's Hanover Trust Co., says that his feasibility studies do not indicate that using the personal computer for electronic mail is an economically valid application. And another executive adds: "I don't think electronic mail and personal computing make a cost-effective tandem. Electronic mail is still reserved for larger machines that can store more messages."

But attitudes like these do not daunt personal-computing industry officials who counter that electronic mail critics simply haven't tried it.

"Electronic mail on the personal computer is clearly in its infancy," says Mausling of Corvus. "People in a small office may still find it is just as easy to walk next door and deliver the message. On the other hand, a large corporation may decide that personal computers don't have the capacity they feel they require to send messages. But as more and more executives begin to use personal computers in these offices, the cost-effectiveness problem will begin to dissipate, and electronic-mail operations will grow in all corporations, large and small."

One of the most serious impediments to electronic mail via personal computers has been the slowness of transmissions—and that is where cost-effectiveness weighs heavy. For instance, transmitting a message at the usual speed of most current personal-computer modems (300 baud) is a slow process that often eats up a lot of the computer's time and increases telephone charges. But this problem is being ameliorated by increased transmission speed, which many feel is a watershed that personal computers must cross before they can truly make their mark in this field.

New software, especially Transend III from SSM Microcomputer Products Inc. of San Jose, Calif., is specifically being marketed to satisfy the speed and economic concerns of larger firms wanting to implement electronic mail on their personal computers. Unlike the various networks that have to be systematically developed and wired, Transend III is a data-communications program that links Apple IIs via telephone lines for immediate message sending.

As envisioned by SSM officials, the product, which is just being released this month, could be used for an individual mailing between two computers or over a nexus that includes, for instance, one Apple as a central electronic mailbox to hold messages—again, the "cubbyhole" system. The Apple could be accessed by up to 100 other computers. But the greatest value of Transend III, SSM officials assert, is that it cuts into the high cost of electronic mail on personal computers because it is designed to be hooked up to the high-speed 1200-baud modems, such as the Novation Apple CAT and Universal Data Systems' 202LP. Until recently, these modems were priced out of the reach of most personal-computer owners.

"Transend III can pay for itself in months," says Dave Wertzberger, SSM vice president of marketing. "For instance, if transmission is scheduled during evening hours over regular telephone lines, Transend III can send a four-page report from coast-to-coast at 1200 baud for less than 40 cents. It would cost $9.50 to send the same report by Federal Express Overnight Service."

Transend III works like a typical electronic-mail system, with similar sending procedures, password security, text editing and unattended mailing as Source Mail and the others.

An uncrowded pool

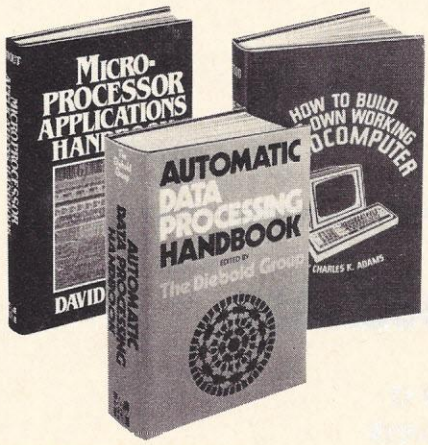
But while SSM is diving into the electronic-mail market, its splash is a lonely one. The firm's competitors are waiting to take the plunge.

"Electronic mail is still not a major force among personal computer users," says George McClellan, owner and president of Southeastern Software Corp. (New Orleans, La.), which markets Datacapture, a popular text-sending program. Datacapture has no true electronic-mail capabilities, such as sending a message to multiple addresses or using the electronic postal-box system. McClellan says he has no plans to upgrade Datacapture to include electronic mail.

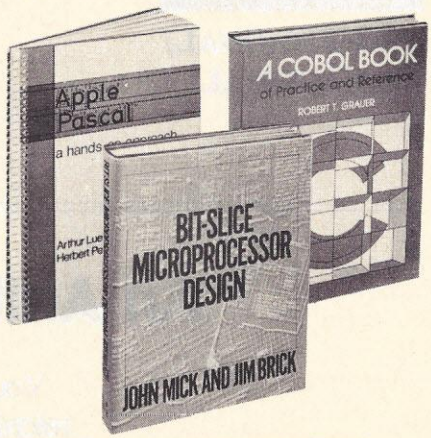
But while most software houses are standing pat, personal-computer

(continued on page 118)

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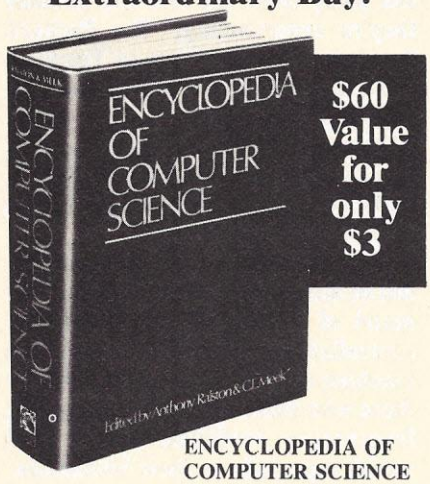
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P39576

An Antidote To Powerlessness

Your personal computer can provide a relaxing diversion from the stresses of work and the strains of everyday life. The result may be a healthier you—both physically and mentally

by David Kull

The complaint has become familiar: The once-competent, well-adjusted achiever seems unable to get *anything* done. The harder and longer he works, the less he accomplishes because he tires easily and often feels tense. His drive turns to cynicism, his warmth to impatience. Furthermore, constant striving for unreasonable goals has shredded his sense of control over events and his self-image. Piecing them together isn't easy, but help may be available from an unexpected source—the personal computer.

The friendly terminal isn't about to replace the understanding spouse, buddy or therapist as a source of comfort for the victim of burn-out, though computers *are* beginning to play a direct role in some formal therapies (See box). Instead, the machine offers its primary antidote in the analytical, computational and organizational powers it lends to those who suffer essentially from a sense of powerlessness.

Productive meditation

The computer's stress-reducing effects are both actual, in that the device can ease the strain of existing business and personal chores, and intangible, in that it gives the user a therapeutic sense of control—even if he is controlling only a machine. Therapy patients are beginning to take advantage of both benefits.

"The personal computer can provide an opportunity for people to focus away from the real-life stresses they're experiencing," Dr. Richard Samuels, a psychologist in Teaneck, N.J., says. "They can concentrate instead on a structured task or game. The ease with which one can become totally absorbed in the computer makes working with it almost a form of productive meditation."

The computer also offers the victim of stress the chance to take command of a complex, yet ultimately controllable, system. Mastery of the machine can provide a special lift for those who must deal with intractable, frustrating problems in the real world, especially in their businesses.

"Resolving problems in the computer's operation gives the individual a sense of control, a feeling of gratification," Samuels adds. "It recharges him."

Psychologist Herbert J. Freudenberger, whose book, *Burnout: How to Beat the High Cost of Success* (Bantam, 1981) helped bring the problem of coping into national focus, agrees.

"The personal computer can help maintain peace in your life," he says. "When you use it, you become orderly in your thinking—and more in charge."

One of Freudenberger's patients, an advertising executive who sensed that his outlook was becoming increasingly cynical and depressed, found relief in his personal computer, but he has a slightly skewed outlook from his therapist's. He saw the *limited* control the personal computer allowed as an attractive alternative to his routine.

"It seemed as if everything in life had become negotiable," the executive says. "But the computer doesn't accept any negotiations. It will do what you want, but only if you follow the rules. You can't persuade a machine."

Another habit?

The satisfaction of controlling a computer or operating in a realm where the rules are clear and uncompromising can be a trap for some people. The feeling of control and well-being, instead of providing a temporary renewal that allows an energetic return to life's struggles, becomes an end in itself. People sometimes delude themselves with false feelings of success. They'll escape into the computer while their real problems continue, and the computer's comfort will postpone resolution of real-world problems.

The antidote? According to Samuels, people should give thought to when and why they're heading off to use the machine. If they feel compelled to seek out the keyboard continually in moments of stress or discord, the computer has become part of the problem.

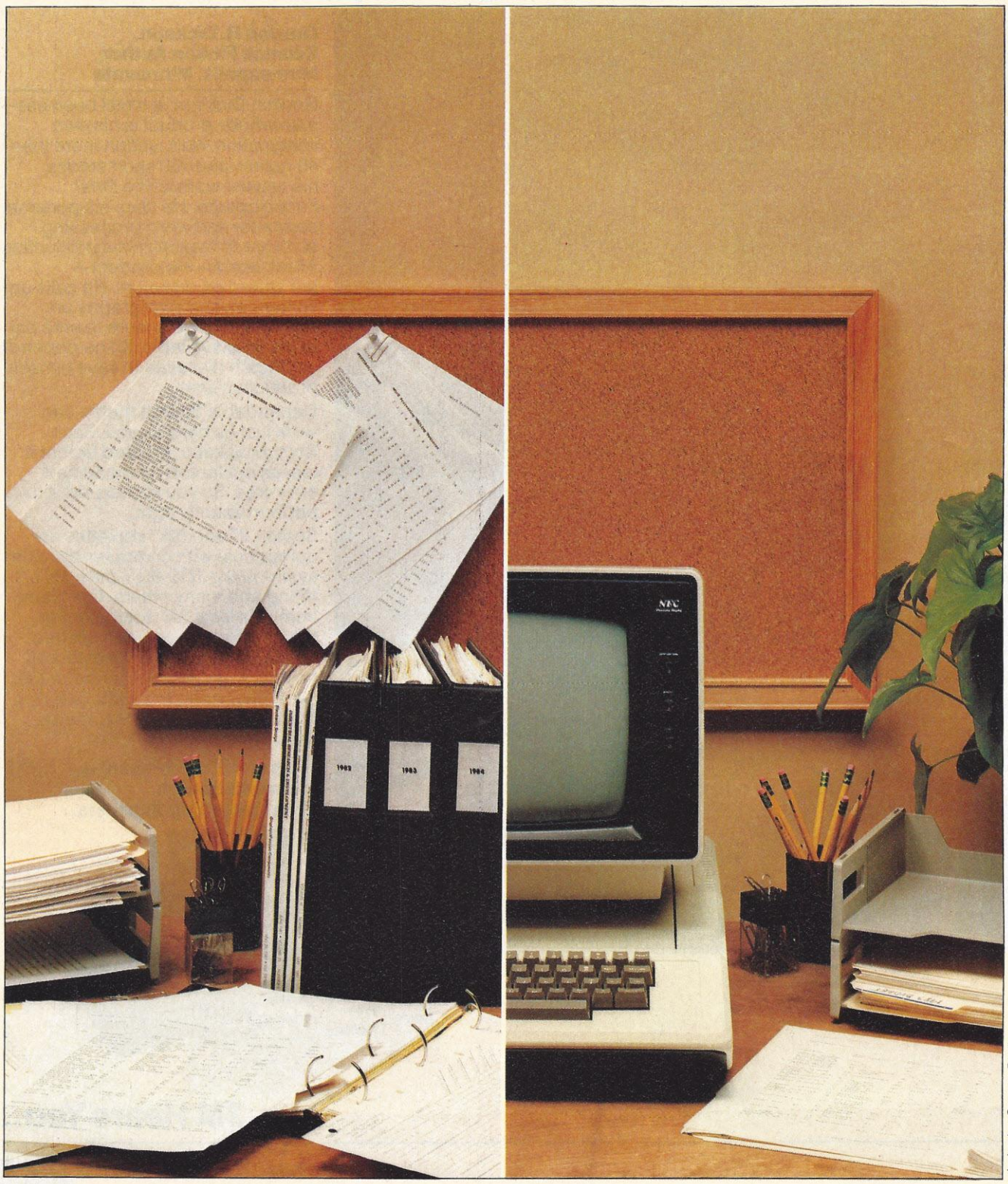
Lost in the terminal

"You're using it as a drug," Samuels says. "You've become a computer junkie."

Because of the computer's addictive qualities, use of the machine is

David Kull, a journalist for 10 years, is management-issues editor for Computer Decisions.

"The friendly terminal offers organizational powers to those who suffer from powerlessness."



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PROBLEMS? TELL THEM TO THE COMPUTER

"Hello, Harold, what would you like to talk about today?"

"My boss."

"Why do you want to talk about your boss?"

This exchange would not be an unusual opening dialog between a therapist and his patient. But it could just as well be the start of a conversation between a computer and its user. Researchers in artificial intelligence have long experimented with programs that allow computers to "converse" with humans. The machines usually respond in noncommittal, thought-provoking terms—much like those an analyst would use to draw out a person's feelings.

The mental-health community is not quite ready to put this conversational software to work treating patients. But one commercially available program allows a personal computer to discuss its user's problems, and psychologists are finding computers helpful to their practices.

The commercial program, "Eliza," is available from Tandy ($14.95), and offers to discuss any problem the user wishes. It responds to key words and grammatical constructions to keep the conversation on track.

Currently, the computer's more serious contribution to psychotherapy is in psychological testing. Dr. Richard Samuels, a clinical psychologist in Teaneck, N.J., has his clients take a variety of psychological tests at the computer keyboard. The technique holds a number of advantages over the traditional pencil-and-paper approach, he believes.

For one thing, Samuels reflects, the machine's "human-like" qualities put people at ease. The programs address clients by name and mix friendly comments in with their instructions. Samuels also finds the computer helpful in taking case histories.

Another testing advantage of the computer is its ability to use branching logic to present the most efficient line of questioning. Depending on an individual's responses, the program skips irrelevant questions and focuses on key ones.

The computer also helps those people who administer tests at Samuel's clinic. The famous Rorschach inkblot test still requires a human administrator to classify responses, for example. But the computer will assess the assigned values and print out a report on their meaning.

Perhaps the most important benefit of computer testing, Samuels feels, is its rapid-scoring ability. Usually, many of the tests must be sent out to scoring services and results are not available for one or two weeks. With the computer, though, they are provided immediately.

"We're able to go over results shortly after the client takes the test," Samuels states. "The immediate feedback has a strong impact on the individual, and it avoids the uncertainty of a lengthy wait for answers."

Samuels sees even more dramatic use of computers in therapy just around the corner. One application now under development, he says, employs the machine to enhance a technique that is already helping people overcome specific phobias. The approach, behavior therapy, allows a patient to confront his fears gradually. Someone who is afraid of flying might begin the therapy by looking at photographs of airplanes. Next, he might watch a film of an airport waiting room. Then, one of a plane taking off. Over time, as he becomes more comfortable with increasingly stressful symbols of flight, he moves onward toward the real thing.

The computer will help in the process by controlling a videodisk player that projects either stressful or calming images. The patient attaches a biofeedback device and begins the program. When the sensors indicate a high degree of stress, the computer immediately shifts the disk player to a tranquil scene. When the stress subsides, it returns the program to the subject of the phobia, perhaps at a slightly less fearful level.

not recommended for compulsive persons, some of whom Samuels fears "might get lost in the terminal and never come out." Freudenberger agrees that the power one thinks he has over the computer can be a dangerous lure.

"Some people use the computer as a substitute for the real world. The computer becomes an obsession," he says. "But if you don't see it as merely an adjunct to your life, you give the machine powers it doesn't have."

While commanding the computer can be either satisfying or addictive, failure to control it can be only frustrating—particularly for high achievers who are prone to stress-related difficulties. One of Freudenberger's patients recently had to pack away his personal computer for awhile because it was hurting more than helping.

"As in his daily life, he tried to do too much with the computer so his programs never worked," Freudenberger says. "It was an ongoing source of frustration."

Playful possibilities

Even those who are not adept at programming can take comfort from the computer. "Just seeing something so complicated operate as a game can be gratifying," Samuels says. "It produces hope because the computer is complex, yet it's working. The world is also complex. Therefore, it too can be made to work better."

A victim of too much stress often cuts himself off from family and friends. And someone who has difficulty communicating to begin with is prone to coping problems since he cannot easily ask for help or enjoy the comfort of sharing feelings with others. The computer helps draw such people together with others and eases communications for them. It can be a spellbinding toy. In fact, the computer as a toy has brought isolated patients in closer touch with their families. The machine is particularly

"Resolving problems in the computer's operation gives the individual a sense of control, a feeling of gratification."

powerful in helping parents and children communicate better. Since children are normally less awed by computers than adults, they can participate in games and programming problem-solving on a more even footing than they enjoy in most family activities. Parent and child share equally in the satisfaction of exploring the machine's capabilities and solving its puzzles together. Usually, whole families are drawn into the fun.

"Often it starts when the father buys a computer for his children," Samuels says. "But the machine is so seductive that eventually all family members are pulled in. It becomes a focus of household entertainment, the way the television has been. The difference, however, is that the computer requires active participation, while television permits everyone to sit back passively with his own thoughts."

A case in point

One of Samuel's patients had sought the psychologist's help because of feelings that he, his wife, and two stepsons lacked togetherness. Having been prescribed the use of the computer, he described it's effect on his family.

"We didn't really share any interests," he says. "In the evening, the kids would play by themselves. My wife might read a magazine or cook, and I'd putter in my shop."

So, when Samuels suggested computing as a family activity, they gave it a try. Since the patient "knew nothing about computers," a relative who was a hobbyist helped him pick out and get started with a TRS-80.

"We use it three or four nights a week," the patient says. "We play games and my wife and I work out out budget on it. The family now has a common interest, and that's good." They have had the computer about a year. While the novelty, and some of the initial excitement, has subsided, the fun and togetherness remain.

"I'm learning BASIC and the boys, who are eight and nine, are starting to write little programs of their own," the patient enthuses. "The computer hasn't been a magic solution to our family problems, but it's helped."

Romance enhancer

Computer games can also help in developing new relationships, a characteristic with distinct mental-health advantages in many situations. The executive who felt comfortable with the computer's lack of persuadability, for example, also occasionally enjoyed its "persuasive" qualities. Re-entering the dating game after his divorce, he found that the invitation "to come up and play with my computer" was a successful, if amusing, update of the traditional "Would you like to see my etchings?" gambit.

The nationwide computer network, CompuServe, in which subscribers link their personal computers to central mainframes via telephone, provides another way for the isolated stress victim to combat loneliness. The service allows individuals scattered across the country to play long-distance computer games—up to 20 at a time can compete in on "space wars" game—or merely to "chat" with others by keying messages into a network set aside for that purpose. These computer klatches are similar to Citizen Band radio conversations, with the chatters adopting handles and dropping into and out of a discussion at will. CompuServe, appropriately, has termed the feature "CB."

The computer's ability to assume a share of an individual's detail work—in his personal life and on the job—provides direct relief from stress. According to Freudenberger, neglect of day-to-day chores (bill-paying, trips to the cleaners) is both a symptom of burnout and an additional strain that deepens the victim's plight. Personal computers have helped a number of his patients get a grip on the loose ends of their lives. Using the machine for budgeting, checkbook balancing, scheduling and filing imparts a healthy sense of organization to the frazzled stress victim.

"You have to tend your programs, keep everything on track," Freudenberger says. "And the computer gives you instant feedback, telling you just where you stand."

As in one's private life, the order a personal computer can bring to an office goes far in easing strain and promoting job satisfaction, even if the office's occupant is *not* in immediate danger of burning out. The machine's benefits on the job go far beyond the time and labor savings it provides.

"With the computer, you have to organize your universe and really understand the problems you're dealing with," says Charles Winter, assistant superintendent of the Mahopac, N.Y., school district. Winters recently put a TRS-80 Model III to work on student enrollment projections, cafeteria management, budget analysis and other office functions. A computer novice, he set up his programs with the help of VisiCalc, the financial-modeling software package.

"Building a computer simulation is kind of like making a voodoo doll," Winters says. "If you can reconstruct a problem, you get a sense of control over it—even if the mastery is largely an illusion."

Total control may be illusory, but the ability to analyze a problem much more fully by computer than by hand is real and provides very real advantages. The closer look increases your chances of finding the best course, and decreases the uncomfortable feeling that you may have overlooked it.

"Some of the projections we do—classroom needs, for example—are conceptually very simple," Winters says. "But it may take hours to work up a solution based on one set of data. By the time you're done, you don't

(continued on page 116)

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CIRCLE 13

SPECIAL REPORT

Educational Software For The Home

What can parents do this summer to help their kids next fall?

by Lee The'

June brings summer and report cards. This month, many a dining table is the scene of earnest discussions about *The Future*—as prognosticated by a child's grades. It could involve the remediation needed to help a child learn to read, or the achievement needed to qualify him for a university scholarship.

Educational philosophers don't like such a focus on grades. They may ask whether Einstein's or Newton's rather low grades are held against them now. Parents might retort that maybe Einstein's folks didn't need to help him qualify for financial aid. But whether a parent focuses on the signposts of his child's progress or the progress itself, computing may be able to help parents help their offspring.

What can parents do in the home to help? This resolves into a sequence of questions: Can computers really help kids learn?; if they do, what kinds of educational software are there?; how can parents find this software; and how does a parent evaluate the software he's thinking of buying?

Dr. Bruce Downing, Commodore's director of industry marketing, thinks educational software can help kids learn. "It doesn't always prove beneficial. But for students who may have trouble with factual information, sentence structure, vocabulary or math, it can. These are fairly structured things that are easily put into a computer. An interestingly written program with immediate feedback will help in these areas.

"It's possible to see disadvantaged learners sit at a computer much longer than they will deal with any other kind of learning situation," says Downing. "It gives students a sense of controlling the learning. Kids lack self-confidence at school because they're not in control. With good software pitched at the level the student needs—not too difficult or too easy—that kind of drill material can be very interesting. With arcade games, the immediacy of controlling something on the video screen is very appealing. And people avoid the embarassment of having to deal with other human beings who might think they're stupid because they didn't get something right."

What else?

Downing has been talking about remediation. But what about enrichment? "Some students are not having trouble with their courses—they're just bored," Downing states. "You can let them experiment with simulations and games that allow them to do problem solving with interesting situations on the computer."

So educational software can remediate and enrich. But we may then ask what there is to substantiate these claims. And in the real world, a solution not only has to solve, but be cost-effective. As Greg Smith, Apple's director of education marketing, points out, the claims were established years ago. He cites a 1978 report by the Human Resources Research Organization, sponsored by the United States Office of Technology Assessment. This study looked at a wide variety of other studies—about 27—done in the 70s on computer-assisted instruction (CAI). "And in every case the net effect was that CAI was superior to or equal to the conventional classroom-environment methods. Some students showed improvement of up to 50 percent on scores, covering everything from military instruction to college to primary grades. The net effect proved, beyond a doubt, that computers are effective teachers.

The trouble lay in the second part of the question—cost. The help wasn't dramatic enough, in most cases, to justify the enormous purchase, installation and operating costs the old time-sharing systems required. And now many schools can't afford computers no matter how much those computers can help.

Scaling down the question to the home environment, most American families would probably still say no for educational applications alone. Fortunately, personal computers can do many things. Thus, while the $1000-$5000 cost of a powerful home system may seem too steep for education—or any other single use—education could be the additional function needed to justify the purchase. And the less expensive systems (Atari 400, Commodore VIC-20, Radio Shack Color Computer, TI 99/4A) could cost no more than a few months of private tutoring. An enthusiastic older child might even go for a matching-fund program, where the parents agree to equal any money

A man who monitors the personal-computing industry even while sleeping, Lee The' is our field editor

"Parents need not be hamstrung in determining their children's education. Providing a child with a computer is like buying educational insurance."

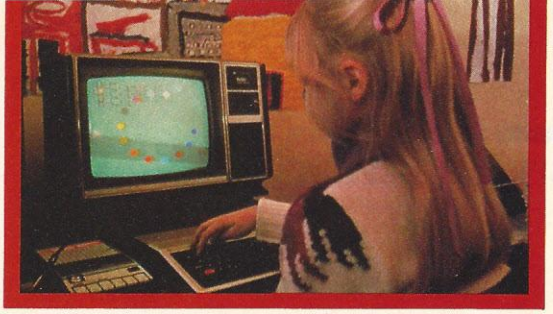
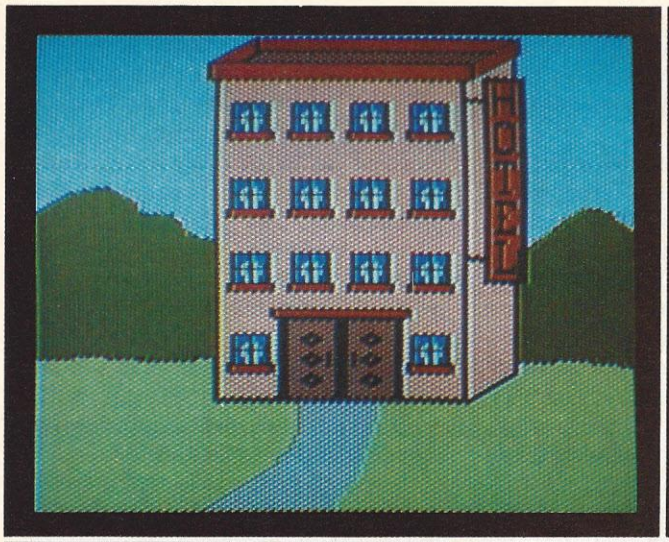
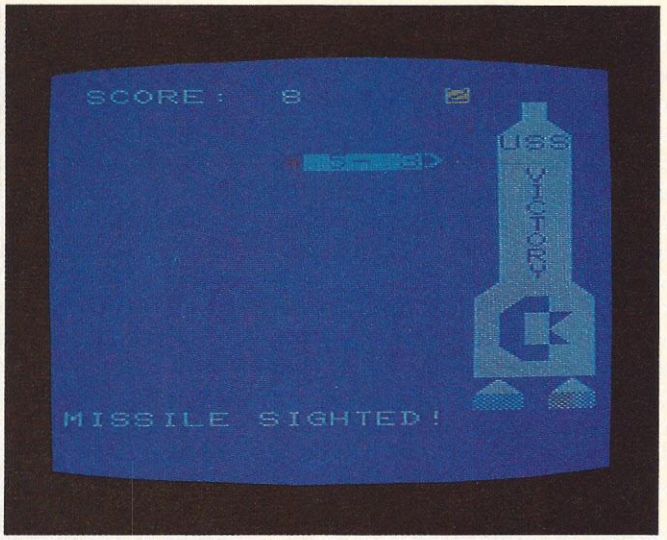
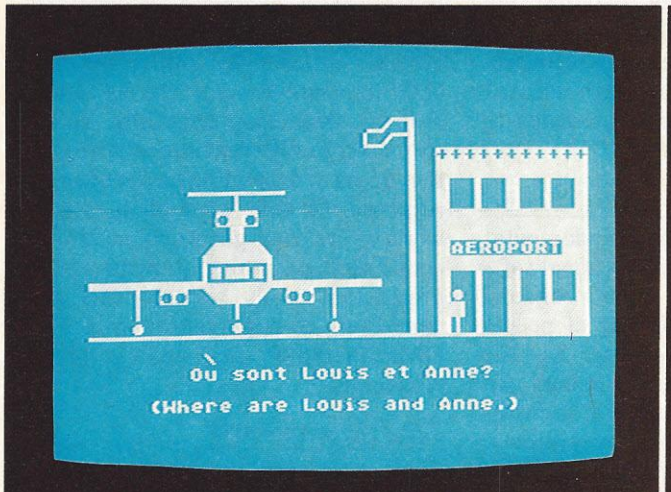
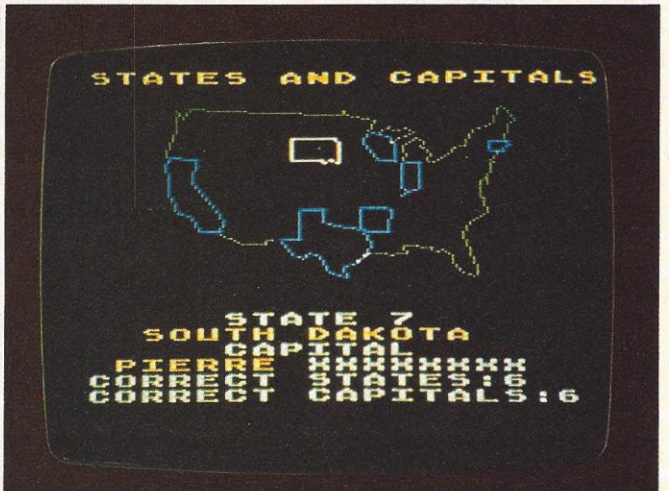


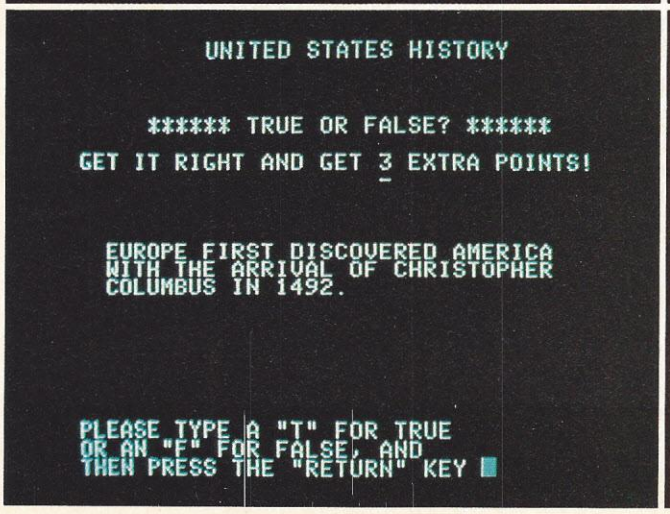
photo by Mark Tuschman

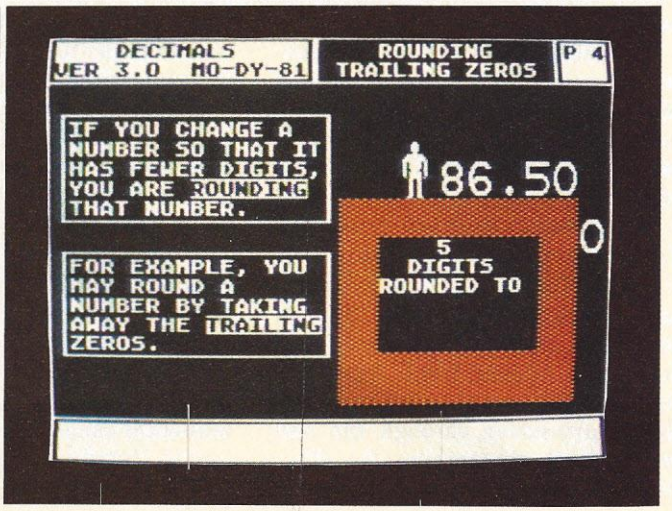












courtesy of Advanced Learning Technology; Edu-Ware Services, Inc.; Apple Computer Inc.; Scott Foresman; and Texas Instruments

he can raise toward buying one.

An important "but" to the cheaper home computers, though, is their limits in RAM (Random Access Memory) and mass storage. Before investing in a computer, a parent should make sure it has, or can have added, enough capacity to run the kinds of programs desired. Simulations, in particular, often need systems with 48k of RAM and a disk drive. So, once more, software needs to be considered before the purchase, not after. Less expensive systems are often advertised at very attractive prices, but parents must make sure that what they can get for that price can actually do something!

Another consideration

The other hardware consideration is compatibility. Having the machine compatible with the one (if any) at the child's school can be an advantage, of course. Then again, the child may want a different machine at home so he can become familiar with more than one system. From the parent's side, an inexpensive system can serve as an adjunct to the main family computer. And there may be less fighting over the use of the principal computer if the smaller one is not software-compatible. If there's a system in the home being used for business, a parent should think twice before adding a lot of educational software to its repertoire.

The substantiation of CAI in general doesn't mean any given piece of educational software works. And already good programs can usually be improved. So the firms involved with educational software—like Apple, Atari, Commodore, Radio Shack and Texas Instruments—continue to do research. They generally have literature available for the asking. Smaller companies are active too. Edu-Ware Services in Agoura, Calif., has established 107 test sites from the elementary-school through the university level, researching the effectiveness of various kinds of instruction. Edu-Ware's founder, Sherwin Stefan, says he'll be publishing the first set of results this fall. He says a national educational-software review board should be one fruit of these efforts.

Krell Software in Stonybrook, N.Y., is working on a different sort of substantiation. Ed Friedlander, Krell's chairman, says he's starting a school using the SAT (Scholastic Aptitude Examination) preparation software his company sells. He's planning to guarantee college board test-score improvement results. Friedlander says that, on the average, students show a 70-point increase in board scores after using the software for less than two hours. Interestingly, Apple's Smith mentions that his own daughter did extremely well on the PSAT after using this software. While that's strictly anecdotal data, it does lend some credence to Friedlander's assertion.

The basic question

But all of this raises a fundamental question: Why does educational software work? Some basic reasons emerge from the thinking of people involved. First, a computer has the patience only the truly mindless can achieve. Second, it can give immediate feedback, problem by problem, not just on whether the child was right or wrong, but why, and what he needs to learn to get such problems correct in the future. Third, it can let the child do dry runs of processes, events and experiments that are too costly, time consuming, money consuming and/or dangerous for him to do in real life. Astronauts learned to land space shuttles on a $5000-an-hour computer simulator. That was a bargain. Fourth, the same dry runs can help children learn to think better—faster, with more flexibility, and with more understanding of consequence—because those consequences can be experienced (vicariously). Finally, what adults call productivity tools, like word processing and data-base management software, can be the same for children. It doesn't take much mental stretching to see these programs as "educational software" when students use them.

The five virtues can be summarized as follows: patience, feedback, simulation, consequence and productivity. The first two are especially important with remediation (helping students achieve passing grades). The last three aim primarily at achievement.

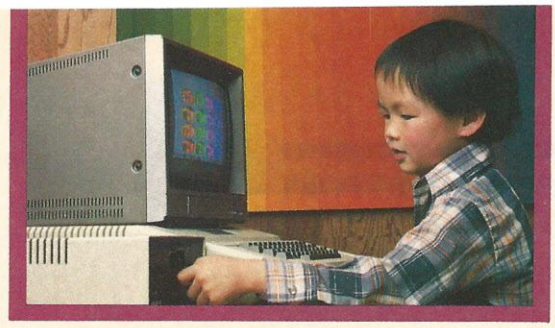
Educational software that can be used in the home addresses both areas. The software divides generally into drill-and-practice/tutorials, simulations and productivity tools. Drill-and-practice software was the first to evolve. Most examples incorporate means of dealing with persistent errors—usually by returning the child to whatever lesson he isn't able to learn. Branching programs, which can move to different sub-sections of the program depending on a student's response, do this, and much of the work of creating good drill software comes from designing branching programs that really help students get past their own persistent errors—errors in either their facts or their reasoning.

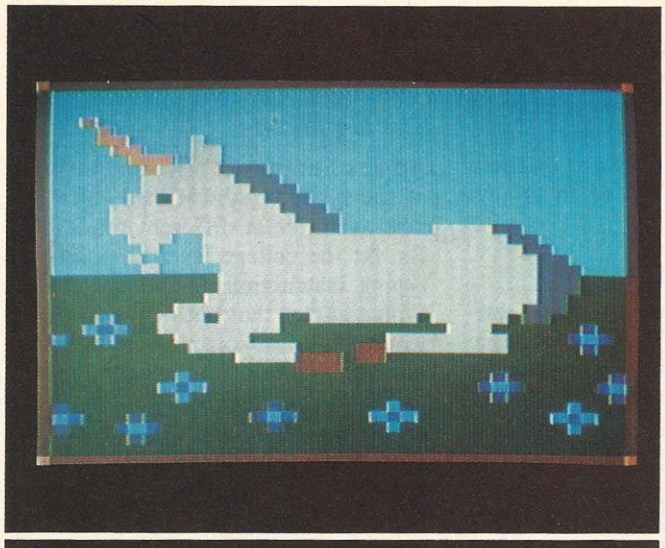
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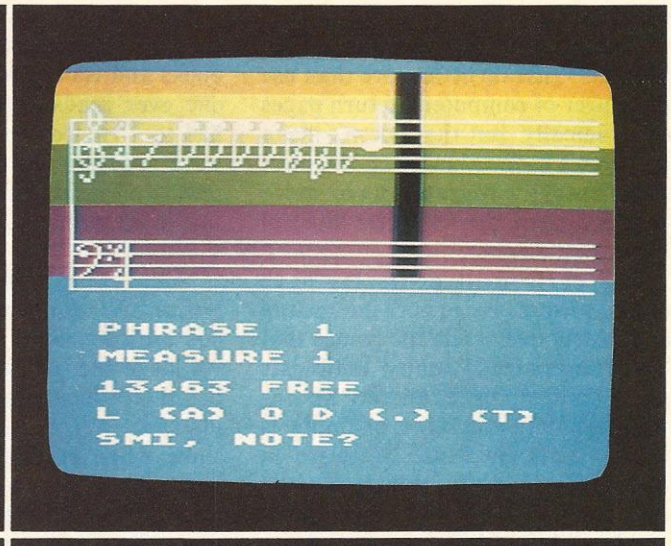
Simulations create models of situations and events. They range from very immediate, realistic scenarios like the one depicted in Lemonade Stand to educational versions of Dungeons-and-Dragons-like fantasies such as Krell Software's Pythagoras. Productivity tools range from word processing and graphics to advanced mathematics and data-base programs. They can be very simple versions for young pupils, or sophisticated programs for corporate managers and researchers.

The first commercial programs for education were basically books-on-disk. Some still are, especially those designed for low-powered computers. ("Low-powered," by the way, means

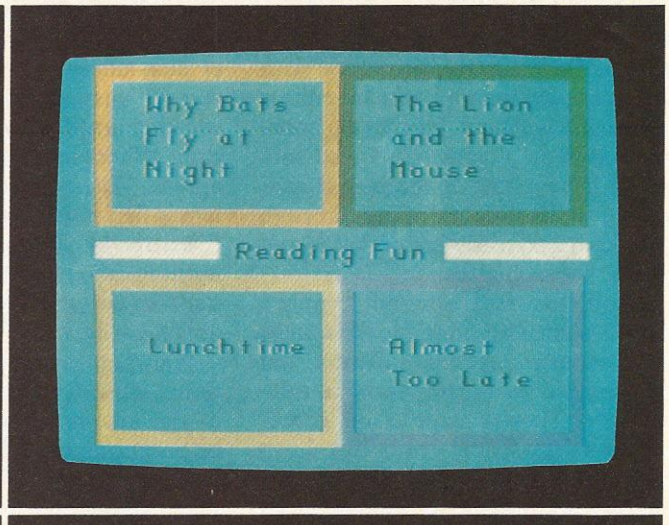
"Parents must know if their children are able to relate processes learned in fantasy situations to real-world situations."

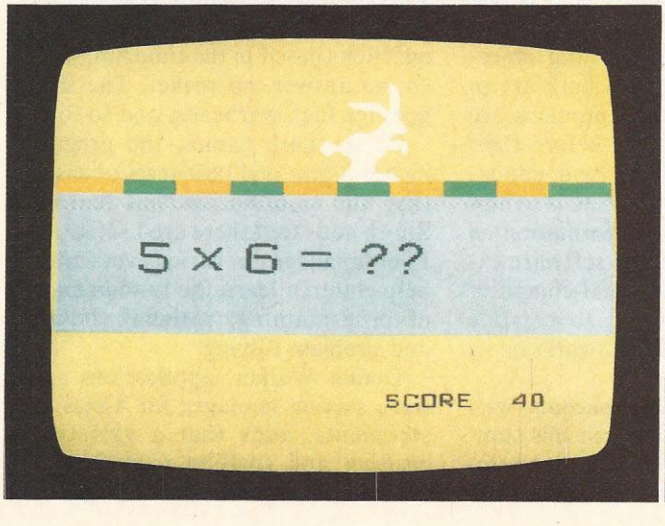


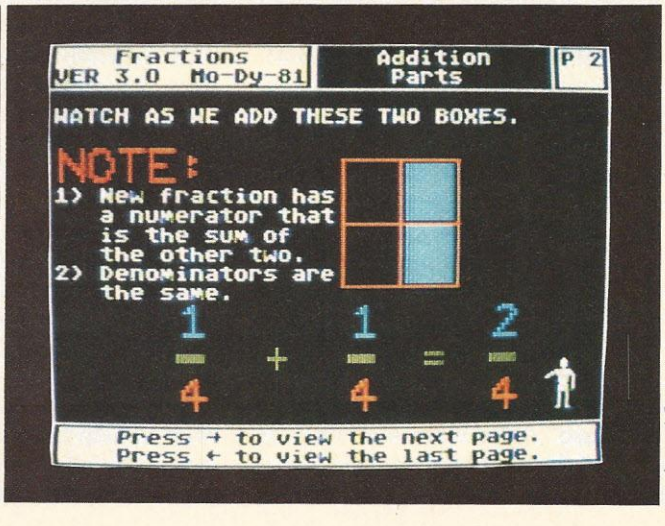












courtesy of Commodore Business Machines and Atari

"If a machine puts on a show when students do something wrong, it will encourage them to answer problems incorrectly."

less RAM and/or mass-storage capacity.)

Computerists sneer at these simple programs that do little more than use the power of computers to turn pages electronically. But that doesn't mean they don't have value. Even the most rudimentary programs have more patience than the saintliest Special Education teacher.

The early drill programs have moved towards being both interesting and instructive, while the games that have obsessed so many hobbyists have sometimes acquired an instructional flavor. One example is Robot Wars by Muse Software in Baltimore, Md. In this game the player designs and programs a robot, and its fighting skill shows the player the consequences of his thought processes. Dave Grady, an editor with Learning Magazine (designed for elementary-school teachers), mentions this as a game that also succeeds in teaching fundamental academic skills like thinking through problems and assessing probable and actual consequences.

Problems still abound. Apple's Smith points out that "dealers know little about educational software, and are unable to demonstrate it adequately. They're experts on games and business software, but have neither the background nor the day-to-day exposure to educational software."

David Wagman, chairman of Softsel (a major software distributor), reinforces this opinion. "There's very little retail market today for home educational software." He thinks one reason for this small market is the difficulty in matching up a parent's specific need with a particular product. "If you look at the total universe of educational software," he says, "and compare it to a typical school curriculum, you'll find that the vast majority of the curriculum is not even addressed. A lot more use could be made of the sound and graphics capabilities of personal computers today to make programs more fun to use."

Learning Magazine's Grady concurs. He differentiates between textbooks and trade books like this: "No one ever reads textbooks unless he has to." He points out that courseware (educational software oriented toward classroom use) often follows suit in its dullness.

Negative encouragement

Softsel's Wagman makes a more serious criticism than dullness, though. "A lot of the software is not soundly based on educational techniques. For instance, if the machine puts on a show when students do something wrong, it will encourage them to answer problems incorrectly so they can enjoy the machine's reaction. A better situation occurs when the computer does not accept anything but the correct answer, and keeps students working until they get the answer right." Sherwin Stefan of Edu-Ware agrees. "The most fundamental problem is that most educational software is written by programmers who know nothing about pedagogy. Software must be designed with clear learning objectives in mind."

Another problem is that traditional educators tend to be ignorant of the unique things computers can be programmed to do to help children learn and grow. Programmers can make computers wag their tails and roll over, but don't know how to tie those capabilities to learning objectives. Those who can do both are in such demand that their products are hurried into production before their gestation is complete. And educational software for the home is so new that no one source of information on course- and age-specific software exists, though each personal-computer manufacturer is trying to compile such lists of software that works on its machines.

This situation puts parents who want to help their children this summer in the role of pioneers. But helping the kids isn't an impossible task. Just because local dealers are apt to be stumped with pedagogical questions doesn't mean real help is farther away than a stamp or a telephone.

The big picture

Apple's Smith does offer an overview of the types of educational software now available at different grade levels. At the college level he points to typing instruction, including several typing games that both entertain and teach. He adds word processing as an obvious function that speeds the revision and correction of papers. A lot of work is also being done in science and math—most notably in trigonometry, chemistry and physics.

At the high-school level, Smith says, are remedial math and algebra, though they are apparantly very hard to program well. Word processing and typing are germane at this level as well. Anyone who's going to be an engineering major in college will probably want to learn programming at this stage, if he doesn't know it already. Another major product type is college-board-preparatory programs.

At the elementary level, the principal software available is remedial math, with both tutorial and practice modes. Smith mentions Random House' Galaxy Math, which includes arcade-game features. To prepare for space battle, the child loads his rockets by correctly answering math questions posed in the time limits given; no answer, no rocket. The same goes for fuel, warheads, and so forth.

Unlike pure games, the program includes pre- and post-tests to ensure that the information was learned. Smith adds that there are LOGO and Pilot languages in various versions to help children learn the fundamentals of programming, rational thought and problem solving.

Donna Walker, applications software section manager for Texas Instruments, adds that a variety of reading and spelling packages are

(continued on page 102)

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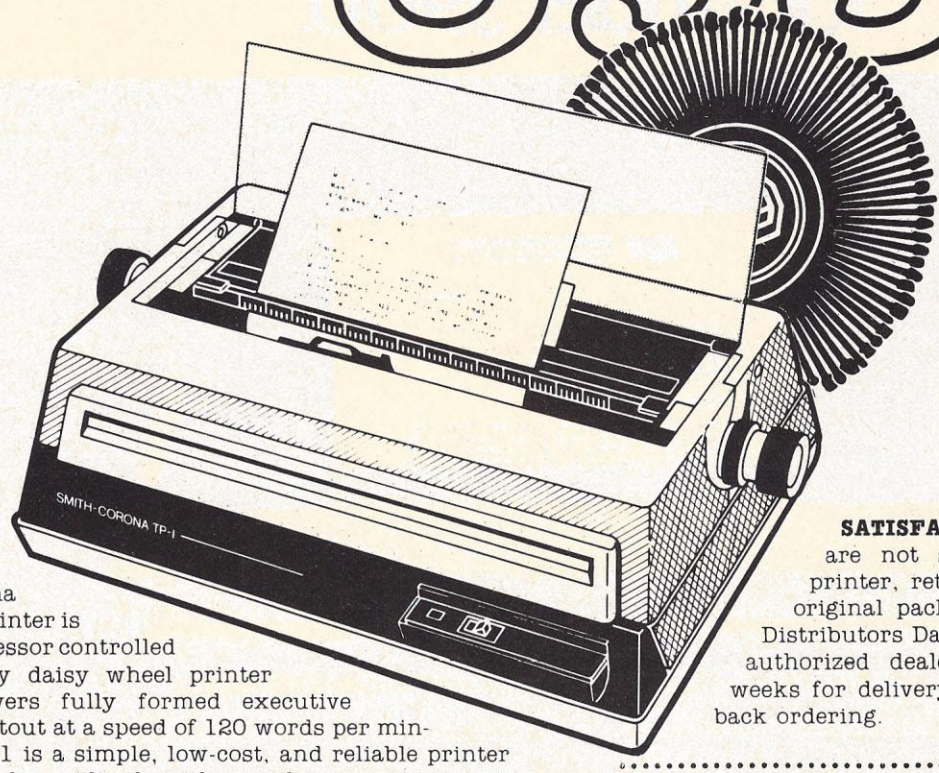
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CIRCLE 15

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CIRCLE 17

Personal Computing Pays Off For Property Managers

While it's still an atypical application, using personal computers for rental management is beginning to pay big dividends

by Margo Downing-Faircloth

An unusual advertisement running recently in the *Real Estate Weekly*, a national trade newspaper, has enticed a host of overburdened landlords.

The ad claims that Micro Management Ltd., a company that uses personal computers to manage rental properties, will take over the paperwork involved in handling tenants with a program of efficient, modern electronic management. Presumably, this would leave the landlord free to enjoy the fruits of his investment. The firm, which has offices in New York and Philadelphia, also asserts that it will process a half million tenants this month.

But despite this organization's apparent popularity, there aren't many others promising similar services. In fact, it was the only one of its type to advertise in the recent issue of the newspaper.

The ad sticks out like a sore thumb, given the ailing state of the real-estate industry and the fact that property management has not always been a very profitable business.

If Micro Management Ltd. is truly doing brisk business, perhaps it is because it is based in two of the largest cities in the United States. Whatever the reason, its use of personal computers for property and rental management is certainly atypical.

According to a recent survey of professional property managers by the Institute of Real Estate Management in Chicago, less than half of the estimated 30,000 managers nationally use computers in their businesses. And, of those who do, close to 65 percent use time-sharing or service bureaus, indicating a widespread use of minis and mainframes.

Some impediments

This is not to say that new software for rental management is hard to find—indeed, more and more of these programs are hitting the market. Though the software takes the pain out of tedious tasks—it organizes tenant files, posts checks to bank accounts, keeps track of vendor bills and payments, and runs tallies on total income, expenses, operating costs, loan status and taxes—there are several obstacles slowing the pace of its success. According to observers in property management, especially those who see a definite place for personal computers in the field, there are currently three impediments to implementation:

- Because the economy is depressed, real estate, which is directly affected by the nation's financial health, is in a slump.
- The number of rental-management packages available for the personal computer is still limited. At best, there are approximately two dozen, some of which have been so haphazardly developed that businesses using them have been forced to dismantle their entire systems and start again from scratch.
- Finally, there is insufficient knowledge, among both programmers and businessmen, about what hardware is best suited to property and rental management. Programmers and businessmen are also confused about the development of software itself. The programmer frequently doesn't know enough about management practices to make a practical and functional program, while the businessman often knows too little about software and programming to choose the best program for a particular job.

A rocky marriage

Perhaps personal computing and property management have had such a rocky marriage because their meeting was apparently under less than ideal circumstances.

It is the typical story of the way any application is born for personal computers. Someone gets an idea, pursues it and, using a market already wanting for software, experiments. It's difficult to say exactly where this application emerged, but industry spokesmen say it is reasonable to assume that either someone working for a software company who had a personal interest in real estate designed a package, or a free-lancer with similar interests found a willing publisher.

Carl E. Collander Jr. is an example. A licensed real-estate salesman in Philadelphia, Collander, in December of 1980, started a company to sell computers.

About a year ago, Collander was called in to write a personal-

Margo Downing-Faircloth, the editor of Dowline, *is a frequent contributor to* Personal Computing.

"Some rental software tracks vendor payments, total income, expenses, amortization and taxable income—along with printing checks."

LESS HAZARDOUS SKI RENTAL

Rental management on the personal computer does not have to be limited to real estate, as Albert Culp of Oklahoma City proved recently.

The whole world of leasing—whether it be jackhammers or lawn mowers or ski supplies—can be a hassle for the customer drowning in reservations and red tape and a headache for the equipment renter who is trying to balance his reputation between profitability and equipment availability. Culp, who owns a bike shop, saw this conflict first-hand while watching Lorraine Wever, the proprietor of the nearby Sun 'n Snow Sports Shop, try to juggle plans for hundreds of ski equipment rentals and winter vacations. So Culp, who had recently purchased an Apple II to handle inventory in his shop, set out to develop a rental-management program for Wever's ski rental business.

To get an idea of how large the people and supply management involved here is, consider this: Wever's sports shop sponsors more than 60 bus trips to Colorado and New Mexico each season, which translates into two or three buses per weekend with 30 to 40 people on a bus. Including the individual rentals, this amounts to 350 sets of skis, 400 pairs of boots and about 400 pairs of poles to keep track of every Saturday and Sunday.

Culp's program is like an extra pair of eyes to monitor the comings and goings of the equipment and customers. It files in the computer a label or form for every pair of skis, boots and poles in stock. This allows an employee to simply type in the dates the piece of equipment is to be taken out and when it is expected back. With the computer doublechecking and cross referencing these rental forms, it constantly updates the employee as to how many of any type of equipment is available for specific time blocks.

computer property-management program for a neighboring real-estate firm. "The computer is almost a necessity when you have more than 100 properties to keep track of," Collander says. "I wrote the package out of sheer frustration. Originally I sent away for a rental-management program but it turned out to be very hard to use. A programmer would probably understand some of these packages, but most of them are not user friendly enough for the average businessman."

Collander says the program he received by mail-order was extremely limiting, because it accessed information based only on number codes assigned to each tenant. If you needed quick data and the number was not at your fingertips, he adds, the software could brake the process of rental management rather than accelerate it.

Smart investments

The program Collander developed, which runs on the NNC Electronics (Huntington Beach, Calif.) Hard Disk Machine, was designed to make the stored information much more accessible.

Those who want to computerize the handling of their real estate are making a smart investment; but, as Collander discovered, they should use extreme caution in choosing a system, according to Nancy Wilshear, an Atlanta consultant who has reviewed and set up several systems for property and rental management.

"People who write rental-management programs for personal computers are not highly trained," she says. "They are good programmers, but they don't understand the accounting principles involved. They don't really know what the end user needs, and they often can't provide support."

Wilshear advises against buying mail-order software. "Some users try to save money by buying through the mail and installing packages themselves. In many cases, they simply create their own problems this way. Many don't know the difference between quality and superior-quality software."

Wilshear adds that users can't expect to buy a $6000 computer, then spend only $100 for software, and come out with a suitable system. "That just does not happen. It takes time and money to develop good software. The user should be aware of that and be prepared to pay higher prices for quality software."

Wilshear offered some suggestions for those looking to buy a rental-management system:

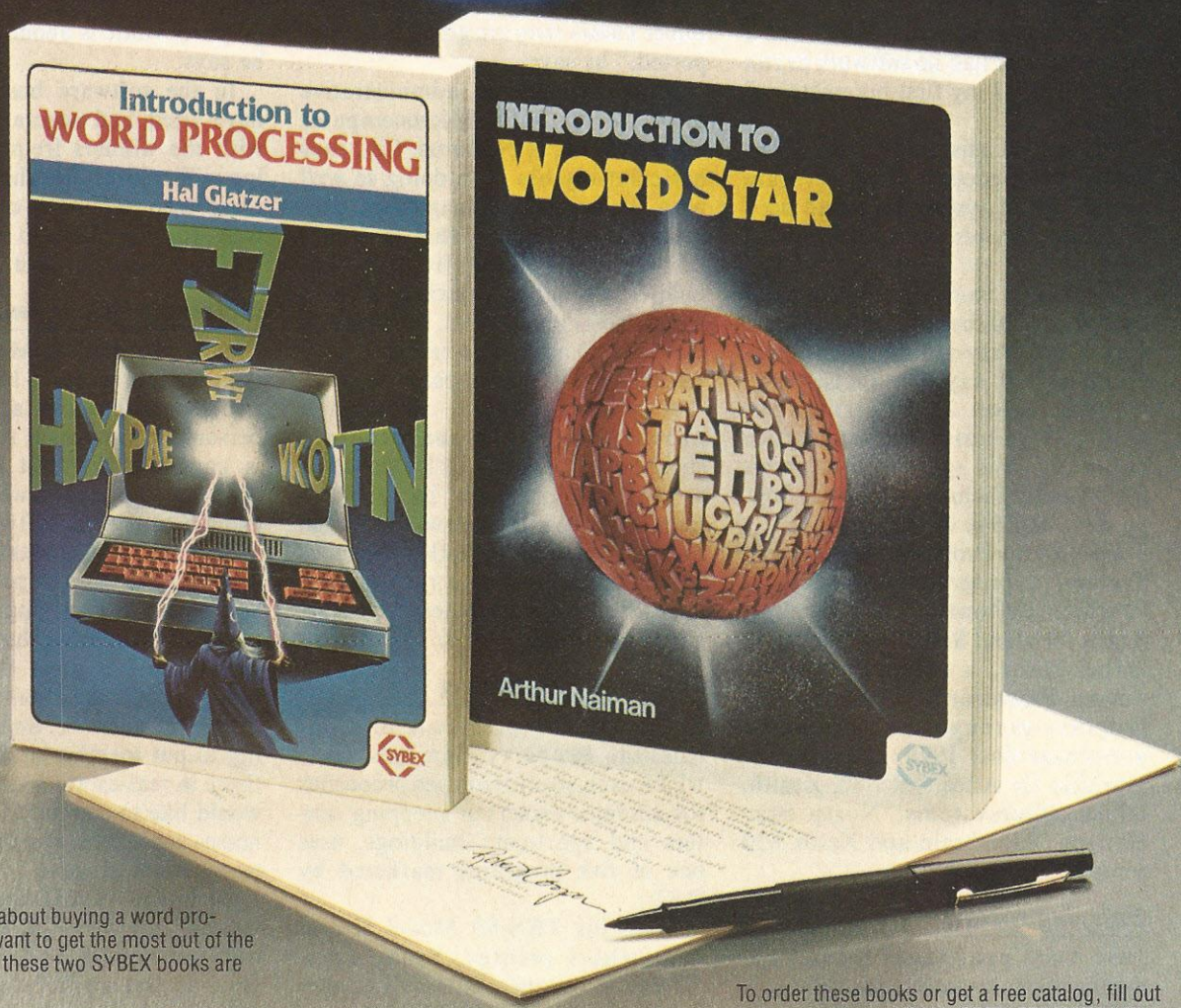
- Look at cost last, but, generally speaking, an adequate system can be purchased for about $10,000.
- Buy the system and software from a local computer dealer whom you can call with questions and problems.
- Carefully evaluate the detail of the reports the software generates. With some programs, an end user simply doesn't get enough detail to justify the cost. Sometimes, the user will still be saddled with a lot of paperwork in addition to a newfangled and seemingly temperamental machine.
- Make sure the system will handle the volume.
- Try it *before* you buy it.

By trial and error

Leon Orloff, owner of Data Byte Corp., a small accounting firm in Skokie, Ill., is a classic example of an end user who made all these costly mistakes and, in effect, learned through trial and error.

Property management now accounts for about 15 percent of Orloff's business, and his Vector Graphic system has been a factor in his real-estate success. "It certainly has enhanced my business. I can give my clients a wider range of services, and the computer has increased my speed and effectiveness. It has cut the time it takes me to process forms and property-management data by 35 to 40 percent," he says.

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CIRCLE 19

"People who write rental-management programs are not highly trained. They don't understand the accounting principles involved."

But the first system Orloff purchased for his business was a disaster. About four years ago, he started doing accounting work for several companies.

"The first year and a half, I had a computer that had no software to run on it; that was my first big mistake," he says.

His second mistake, he says, was not knowing enough about software or the type of system he would need to accomplish his particular type of work.

But a little more than a year after purchasing another computer system, and a property-management program, Orloff says he successfully manages about 25 properties, primarily large apartment and office buildings. His system cost about $9000 and it includes a 5 ¼-inch floppy disk, and 64k of memory.

He uses the Property Management System, a program published by Peachtree Software Co. in Atlanta. It retails for about $1000. According to Isabel Knox, a company spokeswoman, Peachtree has sold about 450 property-management programs nationwide since 1979. The system is available for Altos, TRS-80, Zenith, Ithica Intersystems, North Star Horizon, Superbrain and Xerox 820 computers.

Enjoying success

Just how profitable property-management programs are right now is difficult to determine. But according to the publishers, the programs have enjoyed considerable success so far, and there are more to come.

Bob Maxwell, co-owner of Realty Automation Inc. (RAI) of LaHabra, Calif., says that, as of February 1982, his company had sold 875 property-management packages "in every state of the union and Australia, Mexico and England." The company offers five different property-management programs; all cost less than $1000.

Maxwell, who is a former stock broker, feels that RAI's programs are appealing, because the customer deals with the company directly both during and after the sale is made. "We have good backup, and the customer knows they are going to be supported," he says.

Kathy Champaign, administrative associate for MIN Microcomputer Software Inc. in Norcross, Ga., says her company has been doing so well with its property-management program, The Landlord, that it is concentrating all of its efforts in that field. The program, which runs on an Apple, costs about $395. "We've sold close to 320 and we've had very good results with it," Champaign says.

A good measure of what a property-management program should do is provided by Dake Stone, a property manager in Ormond Beach, Fla. While some warn that too much of the software in this field does little more than keep a running balance, Stone says his system "does just about everything for us."

Your own bull market

Stone, who is president of Continental Property Services Inc., which exclusively manages properties for absentee owners of shopping centers and apartment buildings, uses one of five programs marketed by RAI.

With his TRS-80 Model II and daisywheel printer, Stone says, "We're in our own little bull market here."

Stone says the system credits tenants' files, posts checks to line items and credits to bank accounts. He says the system also balances itself each month and produces year-end financial statements.

"It keeps track of what to pay vendors, total income, expenses, operating expenses, loan amortization, net taxable income, and it prints checks. We put them into window envelopes and out they go. No more writing checks by hand."

Stone says that before using the system, he spent one half to two-thirds of his time doing reports. Now, he says it takes a lot less time and the reports are more detailed. "The business is up fourfold in a year. Our property value is about $25 million," he says.

In the software business, several have tried and several have failed, with the winners frequently becoming millionaires. But there are always those who act more cautiously and wait for the dust to settle before taking a financial dive.

Helping cautious souls

Claude McGinnis of McGinnis Realty in Atlanta wants to help those cautious souls, but this application for personal computers is so new that he is having a difficult time finding property managers who are brave enough to try the software and then talk about their mistakes.

McGinnis thinks property management is a good application for a personal computer, but he realizes that there is a great deal of uncertainty about the quality and practicality of software. So he is attempting to put together a show, whereby those in real-estate management who would like to computerize their businesses could look at systems and talk to experienced users.

Several large real-estate firms, like Edward S. Gordon in New York, use mini terminals and time-sharing systems. But smaller companies can't afford mainframe computer systems or minis. And sometimes, even time-sharing services are too costly.

Despite the plethora of new programs for rental management, the statistics indicate that the majority of landlords and management firms are stepping lightly, lest they drown in an uncertain and volatile market. Proponents of these systems, though, say that soon the quality of software will be so improved that avoiding the use of personal computers for rental management will no longer be a viable option.

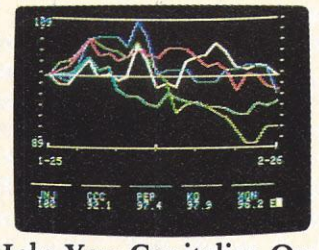
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ADVANCED

A/D Conversion Brings The Real World To The Personal Computer

With analog-to-digital conversion, the personal computer can heat a home, turn on lights and even recognize the sound of its master's voice

by T.M. VandenHeede

After all these years, keeping up with the Joneses is still in fashion. But lately most of the envy is being reserved for the latest in electronic gadgetry. It is becoming more and more difficult to watch the neighbors haul a brand new video toy into their homes and not feel left out at having to miss the newest home screen space invasion.

Owners of personal computers are not immune from this envy. In fact, pretty soon—as they gain more and more control over these machines—their neighbors will be turning greener watching Mr. and Mrs. Jones use their personal computer to "operate" their home.

That's where analog-to-digital conversion comes in. Without it, personal computers cannot control chores in the home and office. With it, your personal computer can regulate heat, lights, appliances, and the like.

What's more those types of chores are just the tip of the iceberg. Analog-to-digital conversion—the process whereby an electrical current that can vary over a continuous range is changed into a sequence of individual pulses that can be understood by a computer—is part of the increasingly sophisticated measurements made by researchers and scientists as well as the computerized control systems used in industry and in cars. Furthermore, it is beginning to play a role in a wide array of educational methods through computer speech synthesis and recognition. Moreover, many feel that if solar energy is ever going to catch on, it is most likely that A/D conversion will be the vehicle that drives it. Analog-to-digital conversion makes it possible to have the personal computer perform almost like a friendly robot.

One man who has delved into the possibilities created by A/D conversion and come out even more intrigued than when he jumped in is Earl Wallace, an engineer who lives in Santa Clara, Calif. Wallace's computerized setup includes an Apple II, a small Sanyo black-and-white monitor, and a little Sears A/D conversion box with 15 connector terminals. He plans to turn this basic system into a complete regulator of almost all the activities of his house.

Residence of the future

When his designing is completed, his household will have responsive lighting, properly monitored heating, automated cat feeding, and a highly sensitive burglar alarm system that can override false alarms. If all goes well, Wallace adds, his cats will lose their "rodent detection and removal" chore to the computer. Sounds like a tall order—a dream—but the first steps have already been taken to turn the Wallace house into a present-day residence of the future.

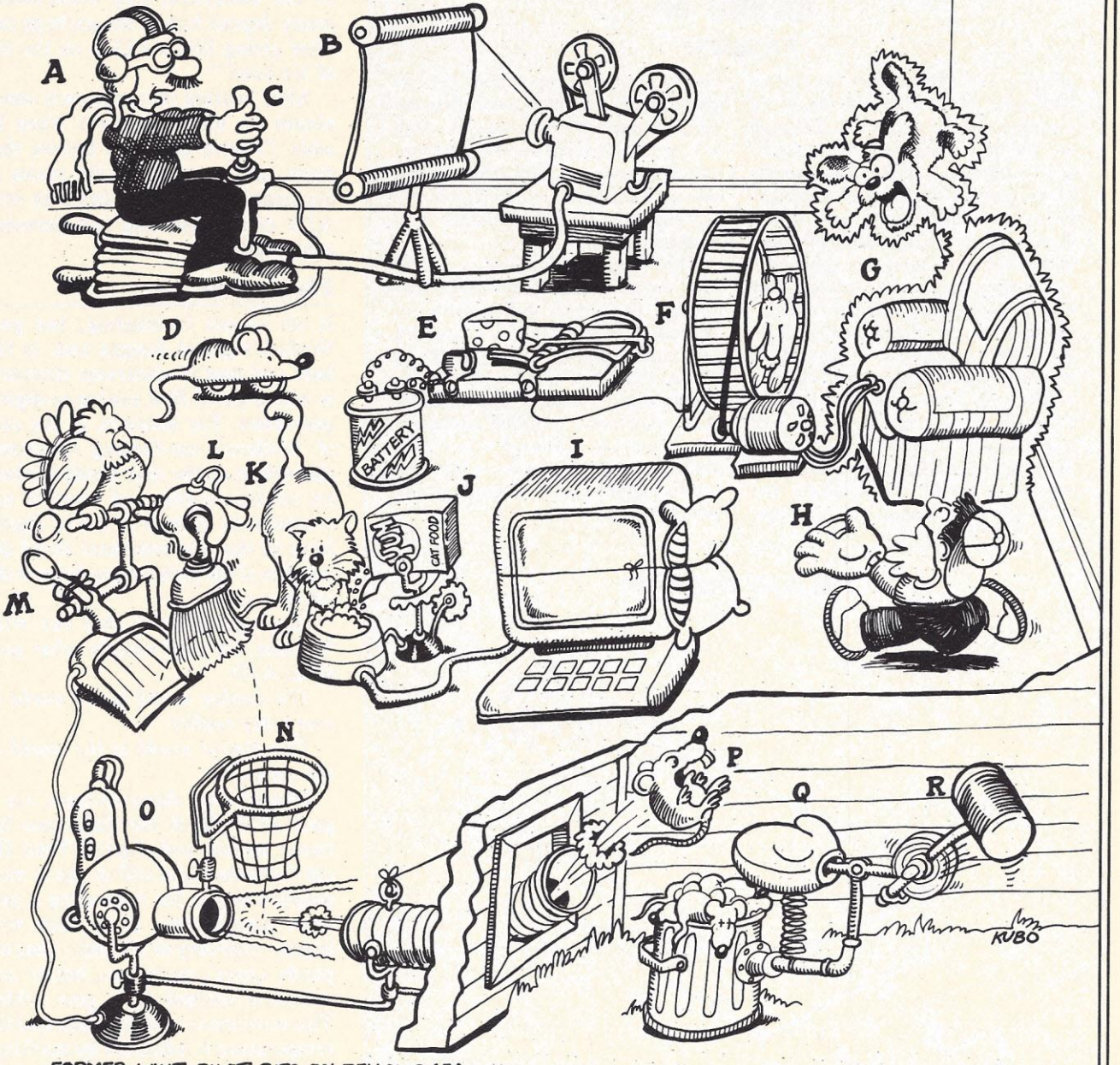
Wallace was inspired to begin wiring his computer to household chores one night when he came home in the dark—a bit under the weather—with arms full of groceries, and cats weaving around his ankles. When he dropped his keys into a space in the doormat and a jar of pickles crashed into one of the cats, mayhem reigned supreme. Deciding that this was "just too much excitement," Wallace vowed to investigate automatic lighting and possibly automatic door opening.

Though Wallace is a topflight hardware-software engineer, his knowledge of analog-to-digital conversion was extremely limited when he began rewiring his home to enter the age of automation. The good news, he found out, was that such control systems are not as difficult or as alien to develop as he first thought. In addition, initial successes have clearly encouraged him.

Take his latest scheme, a combination cat-feeding and rat-detection and removal system. Wallace originally had a plan to set up a dispensing operation that would pour out a given amount of cat food onto a plate automatically when the cat stepped on a wired mat next to his dish. But he found there was a problem: What if a rodent decided to walk up to the cat dish and wait for a little dispensation? The solution Wallace decided upon was to put a small weight detection wire under the cat-feeding station. The wire would allow the computer to decide, from the weight of the prospective diner, whether the animal is the welcome cat or the unwelcome rat. If it is the rodent, a separate mechanism will swoop up the uninvited guest. Then, Wallace says,

Dr. T.M. VandenHeede is a physicist and design engineer who works for a computer manufacturing firm.

"Analog-to-digital conversion won't necessarily make you another Rube Goldberg, but it can get your computer into the real world."



FORMER WWII PILOT SITS ON BELLOWS (A) CAUSING AIRSWITCH TO ACTIVATE PROJECTOR SHOWING MOVIE OF A PLANE CRASHING (B). PANICKED PILOT YANKS ON JOYSTICK (C), CAUSING TOY MOUSE (D) TO MOVE FORWARD TRIPPING MOUSE TRAP SWITCH (E). BATTERY CURRENT STIMULATES RABBIT INTO RUNNING, TURNING GENERATOR (F). HIGH VOLTAGE SHOCK CAUSES SLEEPING DOG TO LEAP INTO THE AIR (G). LITTLE LEAGUER RUNS TO CATCH DOG (H), BANGS INTO COMPUTER SWITCHING COMPUTER ON (I). PROGRAMMED MEMORY TELLS AUTOMATIC FEEDER (J) TO FEED CAT (K). INVADING RAT IS DETECTED AND SCOOPED INTO PAN (L) ROCKING MOVEMENT STIMULATES HEN INTO LAYING AN EGG (M) CATAPULTING RAT INTO BASKET (N) COMPUTER DETECTS PAN MOVEMENT AND SWITCHES HAIR DRYER ON (O) BLOWING UNWELCOMED RAT THOUGH CHUTE INTO BACKYARD (P). BASEBALL MITT CATCHES RAT (Q). ACTIVATED MALLET WHOLLOPS HIM ON THE HEAD (R). DEPOSITS HIM IN TRASH CAN.

illustration by Chad Kubo

"The analog world is the world of every-day reality. The digital world is the world of the computer."

THE RITES OF PASSAGE

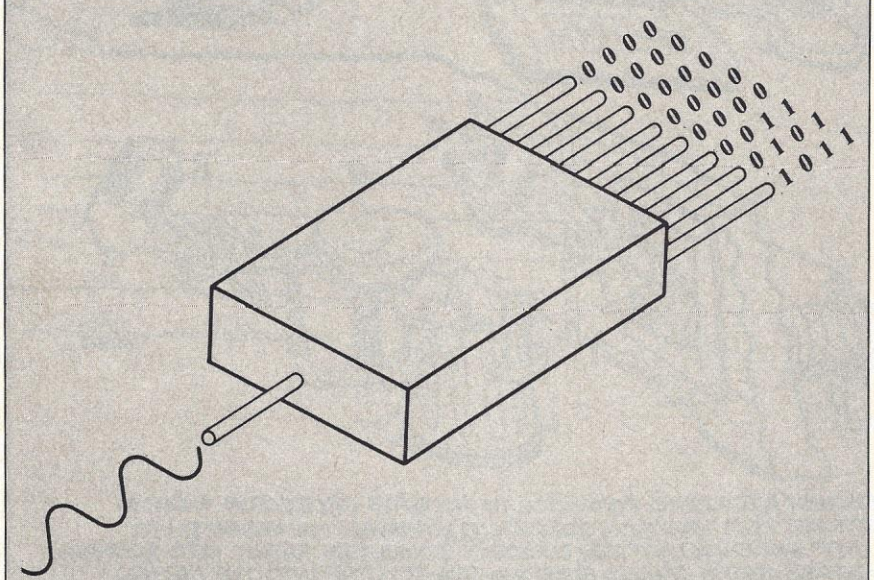
One of the most popular approaches to building an analog-to-digital converter, although not the only available path, is called the "integration method". To provide an example of the kinds of electronic passages required for analog-to-digital conversion, we decided to focus on the components in this approach.

Simply put, the system works like this: A component called an integrator receives low analog voltage from an input device, either a joystick or any other piece of equipment that requires A/D conversion. The integrator sends this current in a pattern of rising voltage to a comparator. When the voltage arriving in the comparator reaches a specific threshold—a few millivolts—its output kicks a logic control circuit into operation. The circuit triggers a counter to complete the A/D conversion by turning its high voltage analog input into a digital output. As was mentioned before, if you own an 8-bit computer, the digital signal emerging from the counter is in packets of eight.

The integration method is one of the slowest available for A/D conversion. The limitation in speed arises because it requires the slow circuitry of a stable analog integrator. It is, however, a reliable technique.

The other principal approach for A/D conversion is called successive approximation. Although it is a good deal faster than integration, its speed means higher cost and some loss of reliability.

THE A/D CONCEPT



Although it isn't this simple, it's often convenient to think of an A/D converter as a device that observes a varying analog signal, such as the sine wave at left, and produces digital words, like those shown at right, whose value at any time is proportional to the size of the analog input.

it will "swoosh him out a small chute to the backyard, and unceremoniously deposit him in the garbage can after giving him a wallop on the top of his head."

After hearing that scheme it seems almost an understatement when he adds, "I have begun to believe that there isn't anything in the realm of my imagination that I can't do with A/D conversion and my personal computer."

The here and now

It all sounds fascinating, but past Wallace's grand designs and, in the here and now of electronic circuitry, is where you'll find analog-to-digital converters. For instance, in the case of Wallace's cat-feeding operation, the weight on the mat would produce an analog signal, and circuits are available to convert it into a digital form so that the computer could determine if the prospective diner is the cat or a rat.

Having traveled this far with Wallace, let's see exactly what goes on in A/D.

The analog world is the world of every-day reality.

The digital world is the world of the computer.

Present day thermometers are a good example of the difference between analog and digital. Take the old-fashioned kind still in use in most people's homes for measuring a person's temperature. It is filled with liquid—mercury or alcohol—that expands (rises) as it gets hotter and contracts (drops) as it gets colder. This movement is continuous, and the temperature is indicated by markings on the glass tube. Although the markings measure specific units of temperature, usually in 0.2 F steps, the liquid in the thermometer can in fact stop anywhere within the tube. Thus it is possible to see that you have a fever of slightly more than 100.2 degrees, but definitely not 100.4 degrees.

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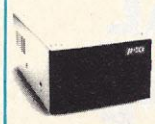
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The Franklin ACE 100 is a personal computer with the power, quality and reliability to meet the most demanding applications of the business professional. It comes complete with 64K of RAM memory which fulfills the demanding memory requirements of VisiCalc and CP/M based programs. The system includes a full upper and lower case keyboard with true shift capability and a numeric pad. The computer generates a full character set to the video screen that displays upper and lower case characters.

The 72 key keyboard includes an alpha lock key which simplifies operation with existing Apple software. The numeric pad cluster includes special keys such as period, plus, minus, greater than (go to) and asterisk (multiply) that are used frequently with VisiCalc.

The Franklin ACE 100 includes a joystick/ game paddle connector, a speaker and eight peripheral connectors. A built-in fan and a 50 watt power supply permit all eight peripheral connectors to be used without power or overheating problems.

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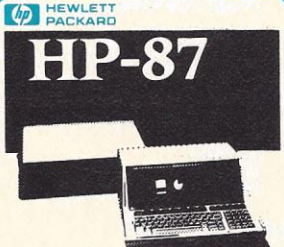


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CIRCLE 20

found in most hospitals, on the other hand, do not measure your temperature continuously. Instead, they give separate discrete readings, usually in 0.1 degree steps. They will indicate that you have a fever of exactly 100.2 degrees, even though your temperature could be slightly higher. What's more, if your temperature rises further, you will not see any change on the thermometer until, suddenly, it registers 100.3 degrees.

Most measurements in the real world are made over a continuous range—again analog—of, say, heat (as with the traditional thermometer), pressure, or distance. But for a computer to control heat, pressure or movement, these measurements must be converted into digital signals, and that requires quantization.

Rounding off

Quantization is the process of round off in the world of electronics. You do the same thing every year on your income tax forms when you round off to the nearest whole number.

Let's return to the example of the digital thermometer. As we said, it can measure your temperature as 100.2 degrees or 100.3 degrees, but not in between. That means that if your temperature is in between, the thermometer must round off and choose one value or the other.

Quantization is an essential part of what takes place in analog-to-digital conversion. What an A/D converter does is regularly sample an analog signal—such as voltage or heat or weight—and transform it into a set of pulses that represent the value of the signal in computerized, binary form.

To bring all of this to a direct example on the computer, the paddle control or joystick on the Apple or Atari is actually connected to an analog-to-digital converter. Turning the paddle left or right small amounts generates analog signals of varying intensity. (The sine wave is used to represent these signals. See figure 1.) These signals are then sent to a board on the computer containing the A/D converter. This circuit is usually a separate silicon chip, and cannot be used for signals from other devices or peripherals. The digital signals that are produced by this converter have exactly measured electrical intensities. (See square sine wave, figure 2.) If your computer is one using 8-bit words, the signals coming out of the converter will likely be in packets of eight. Once the 8-bit digital signals enter the main circuitry of the computer, the software manipulates the information and converts it into movement on the terminal screen.

Plugging in

A/D converters that plug into personal computers are available. Several manufacturers of peripherals make such boards, which at least provide an introduction into Earl Wallace territory.

Wallace uses the Sears, Roebuck and Co.'s converter, which is designed to be plugged into an Apple. Another typical converter is the Model D+7A made by Cromemco, Inc. of Mt. View, Calif. This board, which is compatible with the S-100 bus, can be plugged into many personal computers. The D+7A also contains a digital-to-analog, or D/A converter, enabling the computer's signals to be used to control such things as motor speeds, audio-equipment volumes and lighting intensity.

While these conversion boards do provide a way for the computer to talk to the outside world—and sometimes for the outside world to talk to the computer—it is important to keep in mind that their proper use requires a basic understanding of their engineering and hardware, their applications and their operation. Complex programming, costly contraptions and intricate wiring are still often necessary before these converters can be used practically to either power your home

(continued on page 125)

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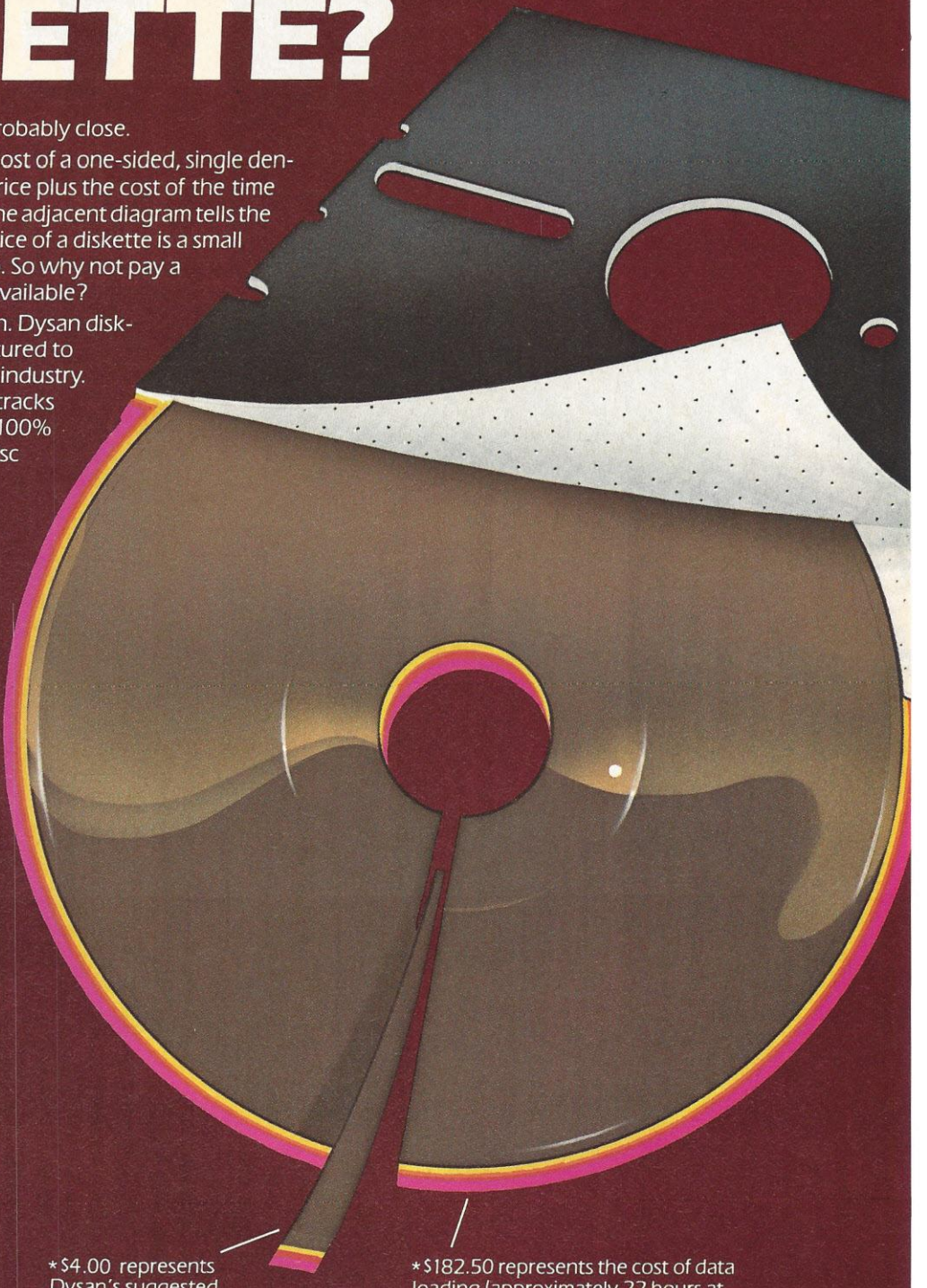
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CIRCLE 21


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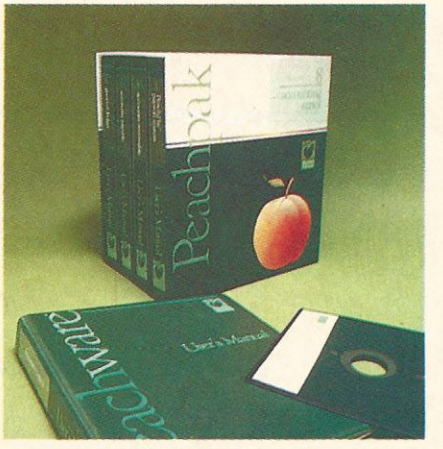
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Inventory
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CIRCLE 23

Computer Games: The Future Present

Turn your computer on fast forward, and discover the history of games over the next 10 years

by Bernie DeKoven

Prepare to sit down at a computer in a university in the year 1990 as an incoming freshman in the recently formed Department of Computer Games and Video Education. The class you are about to take is a history of computer gaming (1982-1990), the prerequisite for any of the advanced courses such as Computer Games Designing and the Philosophy of Computer Games.

In 1985, the university—pushed by a student body demanding more creative degrees in the computer school—caved in and organized the Department of Computer Games and Video Education.

From its inception, entering the Games Department was akin to stepping into an electronic sandbox at four in the afternoon. Groups of students hyperactively stand around computers urging on their programmed progenitors—their quick circuited cartoon aliens—in battles on universal turf. Noise and music of computer war—the blips and fanfares—punctuate the renovated lecture halls where in the early 1970s discussions of the alienated writer in the city were more the order of the day.

To start on a degree path in the Games Department, the prerequisite course is Games 1: The History of Computer Gaming. Prepared for the EDUNET Undergraduate Studies Network, a recently developed computer learning system, the course is an overview of the burgeoning world of electronic games covering 1982 through 1990.

Games 1 has rapidly become one of the most popular courses in the university's curriculum. So if your time machine has stopped spinning, Login—the word EDUNET should appear on your screen—and indulge your fantasies.

: : : : : : : EDUNET : : : : : :
* *
UNDERGRADUATE STUDIES NETWORK
* *
DEPARTMENT OF COMPUTER GAMES AND RECREATIONAL EDUCATION
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HISTORY OF VIDEOGAMES
1. MAINFRAME COMPUTER GAMES
2. ARCADE GAMES
3. VIDEO GAME SYSTEMS
4. PERSONAL COMPUTER GAMES
5. PERSONAL COMPUTER NETWORK GAMES

??????EDUNET??????
(1 2 3 4 5) : 3

VIDEO GAME SYSTEMS

YEAR OF STUDY?1982

VIDEO GAME SYSTEMS: 1982
1. HARDWARE
2. SOFTWARE

??????EDUNET??????
(1 2): 1

VIDEO GAME SYSTEMS: HARDWARE: 1982

Major innovations in video game system hardware precipitated a new wave of public interest. Atari introduced a more powerful version of its Video Computer System

This course was written by Bernie DeKoven, an author and senior games designer for Automated Simulations in Mt. View, Calif., and the material is based on interviews with gamespeople in the computer industry. DeKoven credits their remarks and artifacts for providing the basis of his information.

Speaking with DeKoven during his research were: Diane Asher, Island Graphics; Kerry Bradley, Sirius Software; Doug Carlston, Broderbund; Mike Farren, Automated Simulations; Nasir Gebelli, Gebelli Software; Tom Lopez, Activision; Lyle Rains, Atari Coin-Op; Ken Williams, On Line Software.

"Entering the Games Department was akin to stepping into an electronic sandbox at four in the afternoon."

which had the graphic abilities of the Atari 400 and the Atari 800 personal computers. Coleco, a manufacturer of hand-held electronic games and children's toys, startled the industry with the introduction of the comparatively sophisticated ColecoVision, a modular videogame system with the expanded graphics ability of the new Atari and with adapters that allow the ColecoVision owner to play software produced for other machines—notably the Atari VCS and Mattel's Intellevision.

1. ASTROVISION RE-INTRODUCED MODULAR BALLY ARCADE VIDEO GAME SYSTEM
2. SPEECH SYNTHESIZER FOR MATTEL INTELLEVISION AND MAGNAVOX ODYSSEY2
3. EXPANSION OF BALLY, INTELLEVISION AND COLECOVISION INTO PROGRAMMABLE PERSONAL COMPUTERS

??????EDUNET??????
(1 2) :2

VIDEO GAME SYSTEMS: SOFTWARE 1982

Activision's multimillion dollar success as the first "software house" for video games systems heralded the development of a new industry, paralleling the proliferation of software houses for personal computers. Parker Brothers and Coleco are the first of the major game companies to produce cartridges for the Atari. Imagic and Coleco begin to produce cartridges for the Intellevision as well as the Atari. Software developed for the ColecoVision, Intellevision and the updated Atari prove to have the strongest impact on the state of the art, bringing video games to the home that are graphically as vivid as the current arcade games.

1. FANTASY AND ADVENTURE GAMES FOR VIDEO GAME SYSTEMS
2. PAC-MAN AND THE RISE OF THE CARTOON EFFECT IN VIDEO GAMES
3. INFLUENCE OF THE CINEMA ON VIDEO GAME THEMES AND MARKETING
4. TABLETOP, HANDHELD, POCKET AND WRIST GAMES BASED ON VIDEOGAMES

??????EDUNET??????
(1 2):2

VIDEO GAME SYSTEMS: SOFTWARE
YEAR?1984

VIDEO GAME SYSTEMS: SOFTWARE: 1984
1. IN MOST MAJOR BOOK COMPANIES, PROFITS AT NEW SOFTWARE DIVISIONS EXCEED BOOK SALES
2. UNIVERSAL STANDARDIZATION OF VIDEO GAME CARTRIDGE FORMAT

??????EDUNET??????
(1 2 3 4 5) :5
PERSONAL COMPUTER NETWORK GAMES
YEAR?1982

PERSONAL COMPUTER NETWORK GAMES: 1982
1. DECWARS
2. DOWNLOADED GAMES
3. PUZZLE EXCHANGE

??????EDUNET??????
(1 2 3) :1

DECWARS

Decwars continues to be in the forefront of interactive games for computer network users. Though this Star Trek-like game is continually in progress, members of the CompuServe network could join it, at any time. While in the midst of firing phasers and photons at the enemy ships, players could pause to exchange messages with any other players who were also using the "multiplayer host." This added greatly to the interest in this simulation, allowing players to establish and dissolve complex coalitions of forces over long distances. Though the graphics at this time were limited to that which could be produced on a teleprinter, and the game could only be played by a handful of network-users, it was clearly great fun for the pioneering few. The strength of their enthusiastic involvement did much to lay the groundwork for the vast game networks of the mid-80s.

??????EDUNET??????
(1 2 3 4 5): 4
PERSONAL COMPUTER GAMES
YEAR? 1985

PERSONAL COMPUTER GAMES: 1985
1. HARDWARE
2. SOFTWARE

??????EDUNET??????
(1 2):1

(continued on page 72)

Please turn to the following page for a listing of today's best-selling computer games.

BEST-SELLING COMPUTER GAMES

An informal survey of some leading computer-game software publishers reveals some of the hottest sellers.

Alien Defense and Caterpiller/TRS-80 Model I and II
Soft Sector Marketing, Inc.
6250 Middlebelt
Garden City, MI 48135
(313) 425-4020
CIRCLE 405

Apple Adventure and The World's Greatest Blackjack/Apple II and Apple II Plus
Apple Computer Co.
10260 Bandley Dr.
Cupertino, CA 95014
(408) 996-1010
CIRCLE 406

Apventure to Atlantis/Apple II
Synergistic Software
830 N. Riverside Dr.
Suite 201
Renton, WA 98055
(206) 226-3216
CIRCLE 407

Astro Quotes and Captivity/Atari 400 and 800
Program Design Inc.
11 Idar Ct.
Greenwich, CT 06380
(203) 661-8799
CIRCLE 408

Asylum and Laser Defense/TRS-80 Model I and II
Med Systems Software
P.O. Box 3558
Chapel Hill, NC 27514
(919) 933-1990
CIRCLE 409

Avengers and Jupiter Lander/VIC 20
Commodore Business Machines
The Meadows
487 Devon Park Rd.
Devon, PA 19087
(215) 687-7950; (215) 687-9765 (for VIC calls)
CIRCLE 410

Caverns of Mars and Star Raiders/Atari 400 and 800
Atari, Inc.
Inquiries Manager
Home Computer Division
P.O. Box 427
Sunnyvale, CA 94086
(800) 538-8737; (800) 672-1430 (in CA)
CIRCLE 411

Castle Wolfenstein/Apple II and Apple II Plus
Muse Software
347 N. Charles St.
Baltimore, MD 21201
(301) 659-7212
CIRCLE 412

Conglomerates Collide/Apple II
RockRoy Inc.
7721 E. Gray Rd.
Suite 103
Scottsdale, AZ 85260
(602) 998-1577
CIRCLE 413

Dog Fight/Apple II
Micro Lab
2310 Skokie Valley Rd.
Highland Park, IL 60035
(312) 433-7550
CIRCLE 414

Empire I: World Builders/Apple II
Edu-Ware Services
P.O. Box 22222
Agoura, CA 91301
(213) 706-0661
CIRCLE 415

Escape From Volantium and Intruder Alert/Atari 400 and 800
Dynacomp, Inc.
1427 Monroe Ave.
Rochester, NY 14618
(716) 442-8960
CIRCLE 416

Fantasyland 2041 AD/Atari 800
Crystalware, Inc.
17120 Monterey St.
Morgan Hill, CA 95037
(408) 778-2966
CIRCLE 417

Gorgon/Apple II
Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827
(916) 366-1195
CIRCLE 418

Hi-Res Computer Golf and Zero Gravity Pinball/Apple II
Avant-Garde Creations
P.O. Box 30160
Eugene, OR 97403
(503) 345-3043
CIRCLE 419

Munchman and TI Invaders/TI 99/4
Texas Instruments
Customer Relations
P.O. Box 53
Lubbock, TX 79408
(800) 858-4565; (800) 692-4279 (in TX)
CIRCLE 420

Pilot and Rocket Raiders/Atari 400 and 800
Artworx Software Co.
150 N. Main St.
Fairport, NY 14450
(800) 828-6573; (716) 425-2833
CIRCLE 421

Polaris and Space Assault/TRS-80 Color Computer
Radio Shack
One Tandy Center
Fort Worth, TX 76102
contact your local Radio Shack store or Computer Center

Quest/TRS-80 Color Computer, TRS-80 Model I and III
Aardvark Technical Services Ltd.
2352 South Commerce
Walled Lake, MI 48088
(313) 669-3110
CIRCLE 422

Sargon II/Apple II, TRS-80 Model I and III, and CP/M-based systems
Hayden Software Co.
50 Essex St.
Rochelle Park, NJ 07662
(201) 843-0550
CIRCLE 423

Scott Adams' Graphic Adventure Series/ Apple II and Atari 400 and 800
Adventure International
P.O. Box 3435
Longwood, FL 32750
(305) 862-6917
CIRCLE 424

Star Blazer/Apple II
Broderbund Software
1928 Fourth St.
San Rafael, CA 94901
(415) 456-6424
CIRCLE 425

Temple of Apshai/Apple II, TRS-80 Model I and III, and Atari 400 and 800
Automated Simulations, Inc.
1988 Leghorn St.
Mountain View, CA 94043
(415) 964-8021
CIRCLE 426

The Photar/Apple II
Artsci
10432 Burbank Blvd.
North Hollywood, CA 91601
(213) 985-5763
CIRCLE 427

The Warp Factor/Apple II, Apple II Plus and Apple III
Strategic Simulations, Inc.
465 Fairchild Dr.
Suite 108
Mountain View, CA 94043
(415) 964-1353
CIRCLE 428

The Wizardry/Apple II
Sir-Tech Software
6 Main St.
Ogdensburg, NY 13669
(315) 393-6633
CIRCLE 429

Time Zone/Apple II
On-Line Systems
36575 Mudge Ranch Rd.
Coarsegold, CA 93614
(209) 683-6858
CIRCLE 430

Trivia Trek/Atari 800
Swifty Software, Inc.
64 Broad Hollow Rd.
Melville, NY 11747
(516) 549-9141
CIRCLE 431

ARTWORX. IT'S A WHOLE NEW WORLD OF SOFTWARE.



Scene from BETA FIGHTER during creation using the DRAWPIC graphics editor.

HODGE PODGE: by Marsha Meredith (Atari and Apple)

NOW AVAILABLE FOR ATARI!!! This captivating program is a marvelous learning device for children from 18 months to 6 years. HODGE PODGE consists of many cartoons, animation and songs which appear when any key on the computer is depressed. A must for any family containing young children.
PRICE . . . . . **$19.95** diskette

☐ **PM EDITOR:** by Dennis Zander (Atari, 16K)

Create your own fast action graphics game for the Atari 400 or 800 using its player missile graphics features. By using player data stored as strings, players can be moved or changed (for animation) at machine language speed. All this is done with string variables (PO$(Y)=SHIP4). This program is designed to permit creation of up to 4 players on the screen, store them as string data and then immediately try them out in the demo game included in the program. Instructions for use in your own game are included. PM EDITOR was used to create the animated characters in **ARTWORX** RINGS OF THE EMPIRE and ENCOUNTER AT QUESTAR IV.
PRICE . . . . . **$29.95** cassette **$33.95** diskette

☐ **ROCKET RAIDERS** by Richard Petersen (Atari 24K)

Defend your asteroid base against pulsar bombs, rockets, lasers, and the dreaded "stealth saucer" as aliens attempt to penetrate your protective force field. Precise target sighting allows you to fire at the enemy using magnetic impulse missiles to help protect your colony and its vital structures.
PRICE . . . . . **$19.95** cassette **$23.95** diskette

☐ **FOREST FIRE TWO:** by Richard Petersen (Atari 24K)

FOREST FIRE has been enhanced and now offers a two player mode for head to head competition to see who can survive, suffer the least damage and put their fire out first. User input now determines landscape, wind and weather conditions, offering limitless game variation. FOREST FIRE's excellent color graphics have been made even better, turning your computer into a super-detailed fire scanner.
PRICE . . . . . **$16.95** cassette **$20.95** diskette

☐ **FORM LETTER SYSTEM:** (Atari, North Star and Apple)

This is the ideal program for creating personalized form letters! FLS employs a simple-to-use text editor for producing fully justified letters. Addresses are stored in a separate file and are automatically inserted into your form letter along with a personalized salutation. Both letter files and address files are compatible with **ARTWORX** MAIL LIST 3.0 and TEXT EDITOR programs.
PRICE . . . . . **$39.95** diskette

☐ **THE PREDICTOR** by Thomas Barker (Apple, Atari, TRS-80, North Star and CP/M (M-BASIC)

This is a complete package that covers least squares fitting of parameters for two or more variables. THE PREDICTOR can be used for predicting sales and process behavior, trend analysis, model building and many other uses calling for multilinear regression techniques. Each option in the program is prompted with simple YES/NO commands making it **very** easy to use.
PRICE . . . . . **$29.95** diskette

☐ **PILOT:** by Michael Piro (Atari, 16K)

Pilot your small airplane to a successful landing using both joysticks to control throttle and attack angle. PILOT produces a true perspective rendition of the runway, which is constantly changing. Select from two levels of pilot proficiency.
PRICE . . . . . **$16.95** cassette **$20.95** diskette

☐ **TEXT EDITOR:** (Atari and North Star)

This program is very "user friendly" yet employs all essential features needed for serious text editing with minimal memory requirements. Features include common sense operation, two different justification techniques, automatic line centering and straightforward text merging and manipulation. TEXT EDITOR files are compatible with **ARTWORX** FORM LETTER SYSTEM.
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☐ **MAIL LIST 3.0:** (Atari, Apple and North Star)

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CIRCLE 25

"The disparity between the rote style of educational software and the recreational software led to the Player's Revolt of '84."

(continued from page 69)

PERSONAL COMPUTER GAMES: HARDWARE: 1985
1. VIDEODISC INTERFACE WITH COMPUTER ANIMATION TECHNIQUES
2. SPEECH RECOGNITION
3. BIOFEEDBACK CONTROLLERS
4. TOTAL AND PARTIAL BODY CONTROLLERS
5. EYE-TRACKING AND EYE CONTROL

??????EDUNET??????
(1 2 3 4 5):1

VIDEODISC INTERFACE WITH COMPUTER ANIMATION TECHNIQUES

The unveiling of the CompuConsole was clearly the most significant event of the Consumer Electronics Show in 1985. The device, which links the video disc players, the home computer terminal, the wall video and the digital stereo system into one integrated unit, was the first of its kind to provide the computer game player with the opportunity to experience TIE (Total Illusory Effect).

Though not capable of using the holographic enhancements of contemporary arcade games, the CompuConsole was still capable of reproducing a more vivid and complex simulation than had yet been achieved. Visitors to the display were challenged to launch, land and pilot a planetary exploration vehicle across the surface of Venus. The fully directional environmental sounds coupled with the computer-enhanced videodisc graphics added full sensory depth to the simulation.

So absorbing and precise was this simulation that several perceptive psychologists expressed warnings that this new phenomena could lead people to forsake real-world involvements or even mistake simulated accomplishments for socially validated achievements.

1. THE TIE HELMET
2. THE TIE CHAIR
3. BIOLOGICAL AND PSYCHOLOGICAL EFFECTS OF PROLONGED EXPOSURE TO TIE
4. EDUCATIONAL AND THERAPEUTIC USES OF TIE
5. TIE IN CRIMINAL REHABILITATION
6. ABERRATIONS ATTRIBUTED TO TIE

??????EDUNET??????
(1 2 3 4 5) :4
PERSONAL COMPUTER GAMES
(1 2):2
SOFTWARE YEAR? 1986

PERSONAL COMPUTER GAMES: SOFTWARE: 1986
1. EDUTIE
2. FANTATIE
3. SCI-FI-TIE
4. PORNOTIE

??????EDUNET??????
(1 2 3 4 5) :4
PERSONAL COMPUTER GAMES
(1 2) :2
SOFTWARE
YEAR?1984

PERSONAL COMPUTER GAMES: SOFTWARE: 1984
1. PUBLIC LIBRARIES DOUBLE SOFTWARE COLLECTIONS
2. COMPUTER GAMES BRIDGE GAP BETWEEN EDUCATION AND RECREATION
3. FANTASY AND ADVENTURE SIMULATIONS BECOME MAINSTAY OF PERSONAL COMPUTER SOFTWARE MARKET

??????EDUNET??????
(1 2 3) :2

COMPUTER GAMES BRIDGE GAP BETWEEN EDUCATION AND RECREATION

Research funded by a Presidential Task Force on computer literacy led to conclusive proof that children were actually assimilating more information and developing more relevant learning skills while playing computer games than while attending class. Fantasy simulations of abstract logical and mathematical relationships, and of areas of social and scientific inquiry became exceptionally attractive to children as the graphic powers of the personal computer improved. Educators on the Task Force asserted that computer game players, through their child-like zeal to play all kinds of electronic games, were actually toying with the complexities and subtleties of every known discipline while pursuing what was to them basically an entertaining experience. Meanwhile, "educational software," which was the only kind of software endorsed by the existing school system, was restricted to being a form of animated textbook, offering the user either drill or practice.

The great disparity between the dull rote style of educational software and the exciting as well as informative potential of recreational software led to the Players' Revolt of '84, the collapse of the educational system as an accrediting institution for courseware, and laid the

(continued on page 122)

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CIRCLE 26

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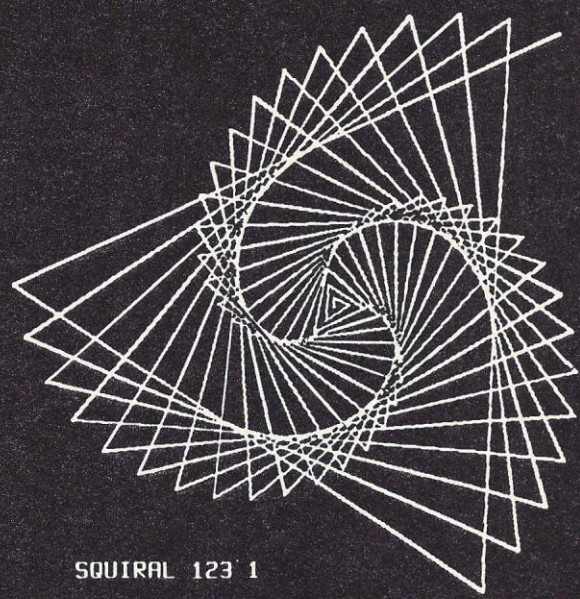
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SQUIRAL 123 1

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The Terrapin Logo language was developed by the Artificial Intelligence lab at the Massachusetts Institute of Technology. Terrapin is now authorized by MIT to distribute the results of its 12 years of research to you. To provide quality support for the language, Terrapin has assembled a team that includes two of the three authors who developed the Logo language for the Apple II at MIT.

Dr. Wally Feurzeig, the originator of the Logo language, Dr. Sylvia Weir, Dr. Nancy Roberts, and Dr. Paul Goldenberg, who have been involved with the Logo project for many years, think the Terrapin Logo language is so good that they have just joined Terrapin's Board of Educational Directors.

Every copy of the Terrapin Logo language comes with complete documentation. To run the language, a 48K Apple II with a 16K RAM card or a language card, and one disk drive is required.

Terrapin also offers the robot Turtle, and the following books: *Turtle Geometry*, *Special Technology for Special Children*, *Mindstorms*, *Katie & the Computer*, and *Apple Logo* from Byte Books.

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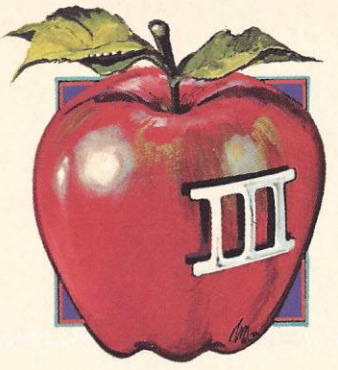


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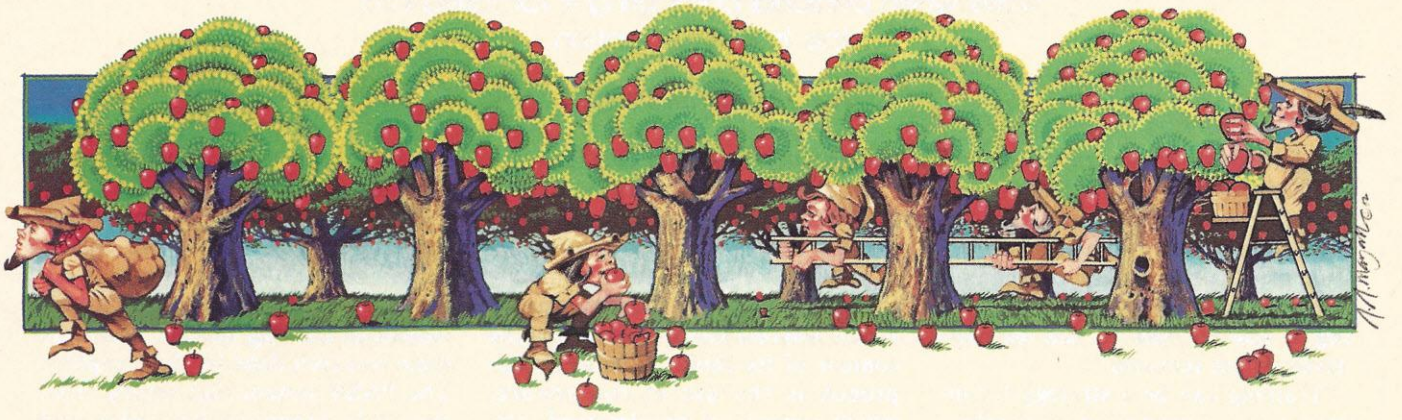
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CIRCLE 27

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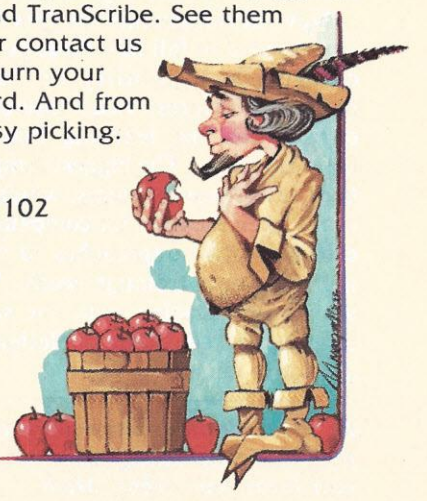
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CIRCLE 42

Take The Trauma Out Of Training

Employee training can be eased in a number of ways when personal computing is factored into the training equation

by Dr. Evan Peelle

With today's concerns about productivity, quality, human performance and the economic climate, the development of human resources is a priority for many companies. And the personal computer is playing a special role in the human-development scenario.

Training can be a strategy for increasing an organization's effectiveness and profitability in that it upgrades the people who do the work and manage the organization. But managers are still searching for cost-effective delivery systems. Training via the personal computer could be an answer.

The personal computer can be used in a wide range of applications for training managers as well as employees. And this approach to training is suitable for just about any kind of company including plants, offices, retail stores, sales agencies, distribution centers and service organizations.

New developments in this field have tended to fall into three general categories: useability or "user-friendly" features, video interactive capabilities and learning management functions. The biggest jump has been in software systems, which virtually open the door for companies to evolve creative approaches to meeting their own training needs. Variations are bursting onto the scene, offering the consumer a plethora of attractive choices.

Dr. Evan Peelle is an organizational psychologist/management consultant from Ann Arbor, Mich.

Currently, there are two basic approaches to computer-based training, and each has advantages and limitations. One is the *software authoring system,* which allows a company to custom-design its training materials for internal use, incorporating the content of its choice. The other approach is the use of *courseware,* which consists of pre-designed, off-the-shelf packaged courses based on general subject areas. The distinction between the two approaches, though, is less clear in practice because courseware developers often modify programs or customize materials to meet a firm's specific needs.

Deane Tierney, regional sales manager for microcomputers at Bell & Howell in Chicago, offers one example of this overlap. "In the near future, if a company needs only one course, say, to teach its salespeople about a new product,. we plan to go into the company, take a look at what its training needs are, and we'll create the lesson." Thus, says Tierney, the firm doesn't have to buy an authoring system and create the lesson itself.

In the forefront

Bell and Howell is a leading company in the computerized training field, and has developed an English-based authoring language called PASS (Professional Authoring Software System). The system is offered through a software licensing agreement, and runs on a Bell & Howell Microcomputer, which Tierney says is similar to an Apple II Plus. So, PASS also runs on the Apple machine.

PASS developed from an authoring language aimed at the educational market, and features were gradually added to accommodate the industrial training market, based on some research done by the company. The PASS system that sprang from the early language has color and graphics capabilities, and provides for essay responses. PASS also interfaces with videotape and disks, and the trainee can interact with the video instead of remaining a passive viewer. In addition, the system's open endedness allows the trainee more creative freedom than is allowed in traditional training situations.

For example, scenarios can be written with the essay capability, which gives the trainee the opportunity to develop his own responses. In essence, PASS simulates a dialog between two people.

"An ideal situation is to have a one-on-one dialog between a person who has some knowledge and a person who needs that knowledge," says Tierney, "but time and money constraints don't allow that for many companies. We're trying to emulate that mode with a personal computer and PASS, so the instructional designer, via the computer, is essentially able to be one-on-one with each individual."

Another feature of PASS is that when a program is written, the system can be programmed to ask questions that will indicate the trainee's knowledge or lack of it. The instruc-

"People are like electricity; they seek the path of least resistance. They'll resist using the technology if it's not made easy."

tional designer can also generally anticipate problems and questions that a trainee might have, and can have correct responses already programmed.

Some help needed

Bruce Frisch, vice president of marketing, indicates that PASS is designed to be easily used by non-programmers, but acknowledges the possibility that some authoring help may be needed. To help in the authoring process, there are licensed PASS agents who are not employees of Bell & Howell who can be hired by customers to assist in developmental phases. Frisch foresees a time when such consultants may be available as generalists to help author training programs in any content area, or as subject-matter experts to provide content and author specific programs. Moreover, Bell & Howell offers seminars to its PASS customers to teach them about computer-based training in general, and to teach the skills required to author good training materials. These seminars will ultimately be offered to the general public.

A variety of companies are using PASS, including Standard Oil of California, General Motors and Farmers Fund Insurance. At this point, customers are primarily large companies. Frisch states that "the smaller company needs a lower priced package," and plans are in the works to meet those needs in the form of custom programs.

But for a company to author its own materials using PASS, costs typically depend on the nature of the program. Initial development time is also usually longer than other training methods.

Low cost teaching

Another software authoring system comes from Micro Lab in Highland Park, Ill. Called the Learning System, the product allows an author to set up a teaching module for industrial training. This module can consist of a composition or an essay tied into questions that are answered by



Control Data has 7500 hours of comprehensive and developmental courseware based on the Plato language that allows for individualized learning.

"An ideal situation is to have a one-on-one dialog between a person who has some knowledge and a person who needs it."

multiple choice, fill-in or column-matching. The Learning System, which runs on an Apple II Plus with Applesoft in ROM, also allows the author to randomize or print out questions, keep scores and perform validity tests.

Stan Goldberg, the company's president, says that the original reason the system was developed was to help corporations teach their employees at a lower cost. "When you teach in an industrial situation," he says, "you take up a lot of valuable management time, and you wind up doing the same training over and over again, which can be expensive." He also says that what a trainee learns is often dependent on the mood and enthusiasm of the instructor on a particular day. "If you're teaching the 45th salesperson that year because you've had a lot of turnover, it's difficult to maintain enthusiasm. With the computer, you create a test, modify it over time, and give it to an employee to learn at his own speed. It doesn't take up management time," he says.

Users of the Learning System are mostly smaller organizations such as the North Carolina Credit Union in Greensboro and the Satellite Community Center in Satellite Beach, Fla. And Micro Lab has been using its system in-house to teach invoicing, the sales system and the warranty procedure, and reports from company quarters are encouraging. As Goldberg says, "It seems that most of the people who work for us become infected by the computer, and many of them end up buying machines for their homes."

Although most of his employees have jumped on the computer bandwagon, Goldberg admits that others can become a little hostile when they make a mistake in their computerized lessons. "I even have one employee who talks to the computer," he says. But overall acceptance of the computer and the training programs are high. "People are like electricity," Goldberg states. "They seek the path of least resistance. They'll resist using the technology if it's not made easy, so the Learning System is designed to be user friendly."

The way the system is set up, it anticipates mistakes a trainee might make, explains what went wrong, and gives gentle redirection. It assumes that the trainee is "computer illiterate," so even a person with no computer skills can be trained on the machine. "We aim our programs at the person who only knows where the on/off switch is," says Goldberg. We don't want someone to become a computer genius—all we want him to do is to get his work done."

The verbal system

WICAT, located in Orem, Utah, also has a software authoring system that training developers can use to create programs for non-computer oriented employees. The system, called WISE (WICAT Interactive System for Education), is designed to ask for responses and analyze answers. It runs on the WICAT system, which is a 16-bit computer with 256k of main memory.

Dr. Fred O'Neal, technical director for WICAT, says that the system has advanced graphic and video interactive capabilities, and also the capacity for computer speech, a significant benefit for computer-assisted instruction. In addition, WISE is menu driven, "and it writes its own code," says O'Neal, "so a non-programmer who knows a little about instruction can sit down and create good training material, without tying up a programmer."

Darby Checketts, vice president of training and education, says that the product is currently in beta test—it is released to two or three companies for a trial period, and those companies provide feedback and suggestions on refinements—so the number of companies using it in its commercial version is zero. But test results from companies like IBM, SmithKline & French (a pharmaceutical firm in Philadelphia), and the U.S. Army Training and Development Institute are favorable.

At IBM, WISE is being used to author programs for the sales and marketing departments, but for SmithKline, WICAT developed a continuing education program, made available through the pharmaceutical company, for physicians. WICAT also developed programs, used in conjunction with videodisks, to teach army service technicians how to maintain sophisticated weapons systems.

As Checketts says, "Computers and videodisks are ideally suited to the need for simulation. It's important to be able to interact with the machine you're fixing, and be able to manipulate the parts and break and fix them without tying up a piece of expensive hardware." The instructor or computer can thus select a "problem," and the trainee can practice locating and solving it in a low-risk, low-cost situation.

A training tool

Apple Computer in Cupertino, Calif., offers a software authoring system that uses the Pilot language and runs on the Apple II Plus. The language was developed in 1973, and an enhanced version called Super Pilot is expected this month. Greg Smith, director of education marketing, says that the Pilot-based system is Apple's effort to fill a need for computerized training, and to provide a tool for trainers.

To assist trainers, Apple has an in-house staff of authoring and subject-matter experts, but no pre-packaged courseware programs are available. "Standard packages rarely appeal to large companies, because they always feel that their needs are unique," says Smith. "Sometimes they are, but for accounting and insurance companies, for example, generally a universal package can accommodate 95 percent of the firms." Nevertheless, says Smith, most companies are interested

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CIRCLE 34

"People who must learn to use a computer at work may often become victims of somebody else's creative zeal."

in customized programs only.

Customers of the Apple authoring system include large companies such as Eastman Kodak, Honeywell, the U.S. military, Bank of America and the American Management Association, but smaller organizations have also been using the system.

Making headway

Other firms making headway in developing software authoring systems and courseware for use in training employees include:

- Control Data in Minneapolis, Minn., which offers both software authoring and courseware. The firm currently has between 7000 and 8000 hours of courses using the Plato language. But the delivery of these courses requires a connection from an on-site intelligent Plato terminal to a network.
- Cdex in Palo Alto, Calif., which offers both generic packages and software authoring. Subject-matter expertise is also available for program development in the area of management training. Forty programs are currently underway on topics such as strategic planning, communications, planning activities and time management. The Cdex approach to computerized training includes video interactive and individualized learning capabilities.

Multiple level interaction

One of the advantages of computerized training, whether the materials are authored in-house or delivered as courseware, is that advances in designing for human factors have removed much of the threat and resistance previously associated with this technology. Technical leaps forward have turned it into a dynamic and actively involving medium that hooks trainees on multiple levels as they interact with the machine—cognitively, visually, physically and soon, auditorally. It is this novel, fun, leading-edge innovation that turns on the high achievers and innovators. The generation of those people experienced with video and home computer games, as well as the home and office personal computer, are likely to take readily to this extension of technology.

As Goldberg at Micro Lab puts it, "The kinds of people we see using and buying computers are generally those who have a more open attitude to change because they're going on to a new frontier. When they are then required to use a computer in a work environment, they're open to it." Perhaps the attraction will be even stronger because this is a personalized application.

Another benefit of this method is that it allows learning to be individualized. People can be led through experiences they need to conquer in order to advance, and do it independently at their own pace. With computerized training "you have put the instruction under learner control," says Checketts at WICAT. "The trainee can learn what he needs to know at his own pace."

Specific qualifications or success criteria can also be established against which a person's capabilities and training needs can be measured. The trainer can manage the learning process by tracking progress and programming the trainee's developmental path according to needs.

An additional point in computerized training's favor is that learning is low-risk—mistakes are a matter between the individual and the computer. Managers may also elect to expand their capabilities through self-directed learning within the privacy of their own computers.

Quality and standardization

Computerized employee training also offers the benefits of formalized instruction. The most important information or aspects of a job can be communicated coherently and consistently, which can be especially helpful if you have a need for standardized content and quality of instruction. As Checketts at WICAT points out, "If information is presented to 10 different trainees on 10 different days, they all receive the same exact instruction. They don't have to rely on the trainer, who obviously interprets and reflects moods." With work that involves complicated tasks or limited error tolerance, this approach can develop precise understanding. It is also a benefit if you have rapidly changing knowledge or skill requirements that demand frequent retraining cycles.

A practical advantage of computerized training becomes evident if there are a number of people to be trained, either because the staff is large or there is a big influx of new hires through expansion or turnover. The greater the number of people, the more cost-effective this approach can be. Not only are expenses spread over more people, but duplication of effort and time involved in repeated training of different individuals can be reduced. And if you have limited time to bring people up to speed, computerized instruction can decrease that up-front inefficiency period that trainees typically go through, particularly if they have to wait for training or "wing it" on their own.

Benefits of this approach may be seen if your people are dispersed or operate out of different locations such as branch offices. Standardized training materials can be distributed to these centers at low cost, which eliminates the expense of bringing people to centralized training locations. In addition, the lost time associated with travel is avoided.

A similar situation where this approach would be viable is when people are working independently or with low supervision like field representatives, sales people, managers or telecommuters. These people can be trained on personal computers at the most convenient locations, which may even be their own homes. Training is accessible when they are

(continued on page 136)

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	12.5	—	—	150	150	—
	13.3	200	200	—	—	—
	15	—	—	180	180	150
	16.4	—	—	200	200	164
Enhanced	10	—	—	—	—	100
Expanded Print (Double Width)		Yes	Yes	Yes	Yes	Yes
Dot Addressable Graphics (Dot/In., H/V)		60/72	60/72	75/72	75/72	72/72
Max. Line Width (In.)		8.0	13.2	8.0	13.2	13.2
Audible Alarm		Opt.	Opt.	Opt.	Opt.	Yes
Out-of-Paper Sense		Yes	Yes	Yes	Yes	Yes
Ribbon, Continuous Loop Cartridge (Yds)		30	30	30	30	30
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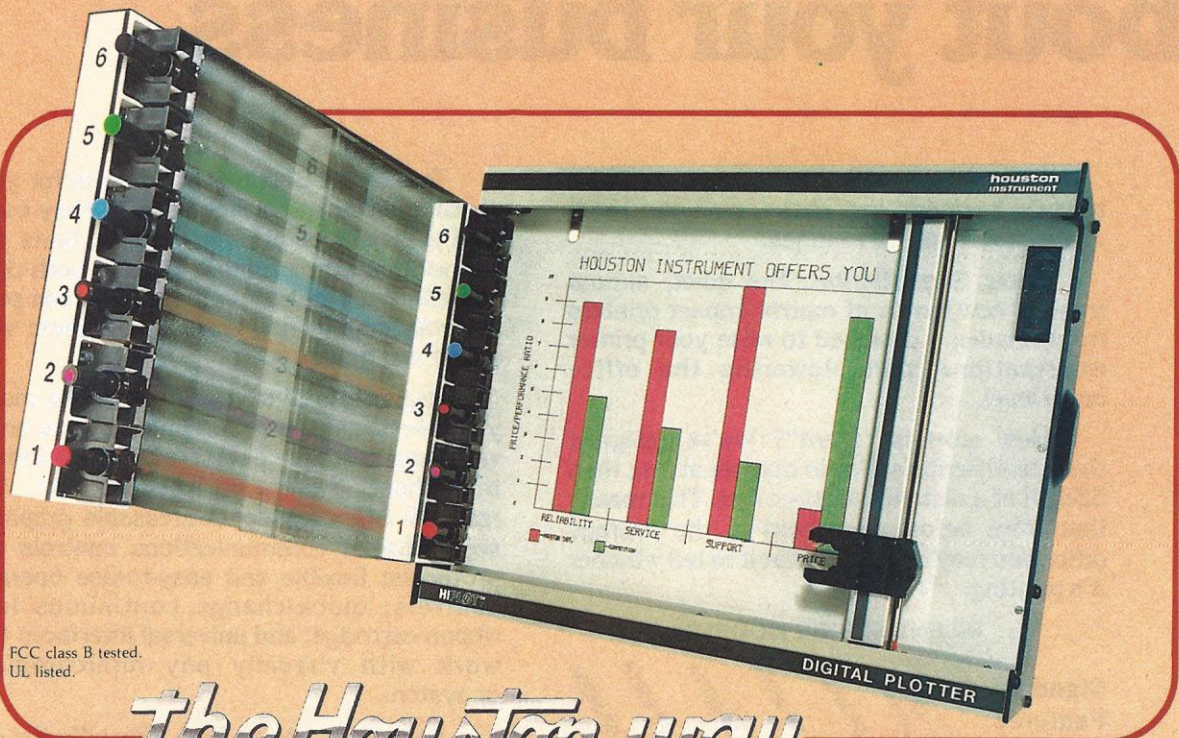
DP-9620A

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CIRCLE 29

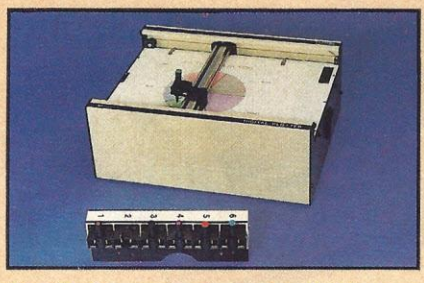
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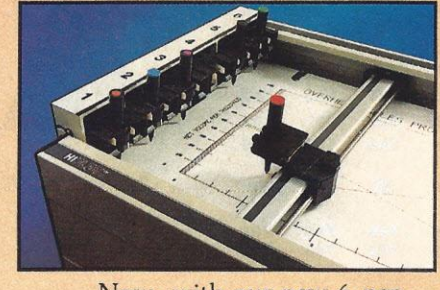
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CIRCLE NUMBER 31 FOR LITERATURE
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ADVANCED

Deliver Yourself From Documentation Devils

A well-documented program spells out exactly what has been done and why—saving you lots of time, toil and trouble

by Henry L. Lefevre

It's really true—there's no such thing as a free lunch. And the person who pats himself on the back for fortunately acquiring a bunch of programs for nothing may eventually kick himself somewhere else for thinking they were really free! Under what conditions would he do this? When the programs aren't documented well or at all.

The fact is that few nonprofessional programs are adequately documented. Those that come with little or no documentation will cost the user in time and aggravation, because it will probably take him more time to figure out how to use them than it would take to write the programs from scratch.

Your own programs

What if you're writing your own programs—ones you may want to sell? You'd better document them, and do it well—otherwise the buyers will pester you until they know how to run the programs, or they'll try to get their money back. And, as we've seen, even if you give the programs away, you may still be pestered.

Another problem: What if you want to change your own program? If you haven't taken the time and effort to document it, you may spend hours trying to figure out what you did and why you did it. One small change to a poorly documented program may take hours of troubleshooting that really shouldn't have been necessary.

Good documentation includes a number of specific things: It must include hardware requirements, users' instructions, program limitations, edits, subroutine information and definitions. When any or all of these six items are missing from a long program, the debugging and programming costs often exceed the cost of the original program.

Hardware requirements

Good hardware documentation should answer the following questions:

- Does your program run on the TRS-80, Apple II or PET?
- Does it require 4k, 16k, 32k or 48k of memory?
- Does it need a cassette, disk drive or two disk drives?
- Does it require a system with Integer BASIC, Advanced BASIC or FORTRAN?
- Is a printer required, optional or not used by the program?

The hardware requirements should be shown on the outside of the disk or cassette storing the program; this helps potential users avoid programs that their hardware won't be able to handle. It also keeps you from being blamed when the program won't run because of the user's equipment limitations.

Instructions

Documentation of instructions is a must. Have you ever tried to use a program that started out with a big question mark on the screen—one question mark and nothing else? This can be awfully frustrating if the documentation is inadequate or nonexistent. You can list the program to find out what the computer wants, but *good documentation includes good instructions.* Each time the computer needs user input, the exact nature of the input should be listed on the screen.

Users appreciate knowing what a program can't do, as well as what it can. For example, take a program that charts numbers on the screen. If you have a TRS-80, your chart program may be listed to 128 points. An attempt to enter 129 numbers could stop the program when the screen runs out of space. The best approach is to program the computer to handle additional points by limiting the chart routine to the last 128 points entered. The second best approach is to mention this limitation in your documentation.

Edits

Another item that must be included in a good documentation program concerns edits. Edits within a program supplement the documentation. When you enter numbers to be used in calculations, you will be helped by the following type of edit:

```
5000 INPUT "TYPE THE YEAR
     OF SALE AS 80, 81, OR 82";
     YR
5010 IF YR 80 OR YR 82 THEN
     GOTO 5000
```

Line 5000 tells you how to enter the data. Line 5010 sends you back to line 5000 if you don't follow the in-

Henry Lefevre, based in Denver, Colo., occasionally contributes to Personal Computing.

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CIRCLE 33

structions. This type of edit would be used in, say, a biorhythm program where you have to know how many days there are between two dates. The edit is also useful in calculating the cost of the money you plan to borrow, or the earnings you expect to get from a savings account.

Subroutines

Most programmers use subroutines to save space when a procedure is going to be used more than once. They can also be used to divide large programs into more manageable parts. Many subroutines need only be used once; some may be only one line.

A good procedure for documenting a subroutine is to open it with a remark showing what the subroutine does and where it comes from. If more than one part of the main program calls on the subroutine, each GOSUB location should be documented in a remark statement attached to the GOSUB instruction. This procedure helps you debug your program.

You should also explain the purpose of your subroutine in a remark attached to your GOSUB command. This can reduce a user's troubleshooting time by many hours.

Definitions

One of the most difficult bugs to find in a long program is born when a single variable name is used for two different variables. For example, you might use "I" to define interest costs early in a program, and then use "I" as the counter in a FOR/NEXT loop later on. The next time you use "I" for interest costs, you will get the wrong answer. You may also get ulcers looking for the error.

It's pretty smart to keep a record of each variable used, the first time it is used. When you are programming, you can keep this record on a sheet of paper with the variables listed in alphabetical order. Another good idea is to reserve the letters I, J, K and L for counters and FOR/NEXT loops.

An additional precaution is to use double letters for regular variables. Double letters help identify the variable's real function better than a single letter or a combination of letters and numbers. For example, you can use OP for option price, SP for stock price, YR for year, and so on.

All variables should be defined in remark statements at the beginning or ending of a program. This kind of thorough documentation will save precious time.

You seldom have to worry about space limitations unless you are working with a small system having only 4k of memory. Habit, however, is hard to overcome. Programmers who start with 4k systems often act as though space is more important than documentation. Some of them maintain this belief after expanding their systems to 32k or 48k of memory; they don't change their thinking or their habits when they add more capacity to their computers. As a consequence, many of their programs are hard to read. A simple example is this:

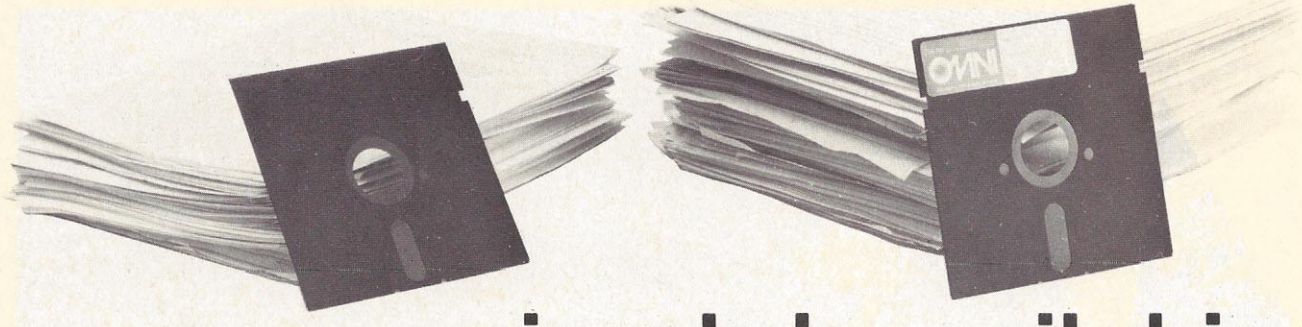
```
10 FORI=1TOYR
20 ?I;:GOSUB1000:NEXT
```

This programming is very compact and efficient; it is also confusing. What's wrong with using more space so that you can understand your own program without a code book? A much clearer example for this same procedure would be the following:

```
10 FOR I = 1 TO YR : REM YR =
   THE NUMBER OF YEARS TO
   BE COVERED BY THIS
   REPORT. . . . . .
20 PRINT I
30 GOSUB 1000 : REM TO CAL-
   CULATE THE INTEREST TO
   BE PAID DURING THE YEAR
   (YR)
40 NEXT
```

The two programs do the same thing—but the first is difficult to follow and explains nothing. Six months after you write it you might have a hard time figuring out what you did and why you did it.

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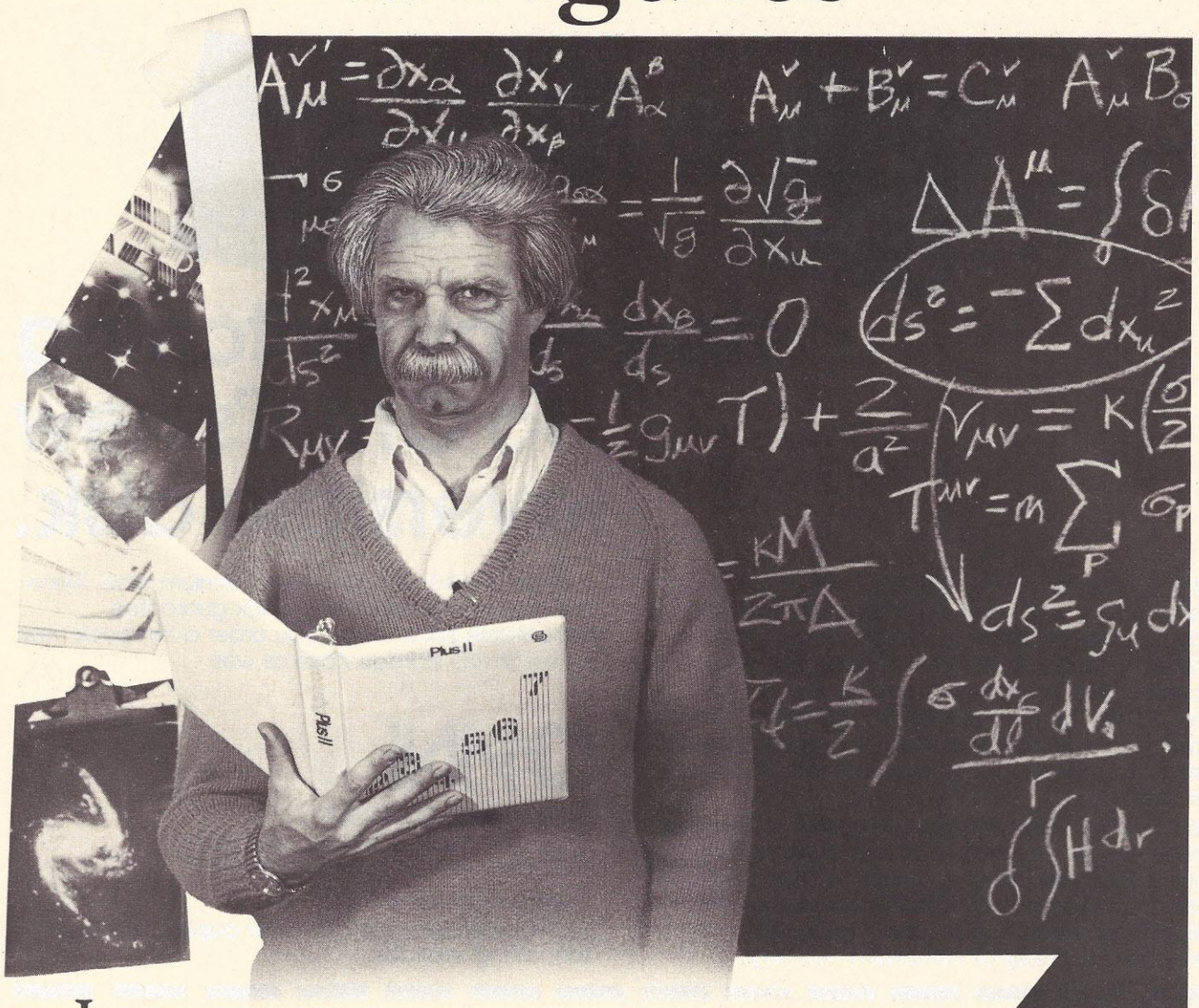
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CIRCLE 103

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A Cure For Coupon Clutter

Automate your coupon inventory and save money and hassle at the supermarket

by Lawrence A. Tomei

Grocery shopping. It's unavoidable, unless you're one of the fortunate few with household staff to purchase, prepare, and present your meals and see to your every shopping need. But if you're a member of the hoi polloi, you get to make that wonderful trip to the market at least once a week, like it or not.

Obviously, the personal computer has not been adequately equipped to handle the long lines at the store, and it certainly makes a poor substitute for a two-inch filet mignon, but that little machine can help you organize a terrific coupon inventory that will substantially reduce your grocery bills.

Let's face it—it takes a whole lot of coupons to save some real bucks. And once you've taken the pains to collect all those little pieces of paper, you still find yourself going through them again and again to find the ones that match up to the items on your shopping list. The bottom line is that all too often, the time and effort you must spend are rarely worth the few cents those coupons will save.

As they say, there's a better way. Consider this: an automated coupon inventory system that can easily track over 500 coupons by brand name, description, category, expiration date, expected cost of the item, quantity discounts, net cost and percentage of savings. This handy system will let you catalog your coupons for easy access, search and update the data base, and save/load disk files. When marketing day arrives, the system will help you plan your shopping trip by showing you each coupon, letting you select or reject each bargain, and preparing a listing of those coupons you will use when you go to the store. Q-PON Helper is the name of this money-saving coupon inventory manager.

What exactly do you need to make

Montgomery, Alabama's Lawrence Tomei is an occasional contributor to Personal Computing.

UNIQUE APPLESOFT STATEMENTS

LINE NR.	CODED STATEMENT	APPLICATION
20	GG$ + "G^{C}"	A Control-G is placed within quotes and PRINTed in the program to sound the Apple's bell (speaker). PRINT GG$ is used to alert the user audibly, primarily to identify errors.
20	D$ + CHR$(4)	Used by the Apple disk operating system to prefix all disk-accessing commands.
730	INVERSE NORMAL	Used to highlight text as black on white (INVERSE) and return to (NORMAL) white on black.
650	POKE 32,0 POKE 33,40	Commands used to adjust the left margin of the screen (32) and its total width (33) in characters. Used to alter text window during coupon selection routine.
870	PR#1 PR#0	Directs output to Apple's I/O slot #1 (printer) or slot #0 (monitor screen).
870 950	PRINT "I^{C}80N" PRINT "I^{C}40N"	Although the Control-I does not show up on the listing, this entry redefines the length of the output line to 80 characters. The lower example entry reverts the output line to the normal 40 characters.

FIGURE 1



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WESTICO
The Software Express Service

the Q-PON Helper work for you? A 32k Apple II with one disk drive and an optional, but highly recommended, printer capability. Figure 1 shows the few unique statements needed for the program, which has been written here in Applesoft BASIC. (It can be easily translated into any other floating-point BASIC language.)

Program options

Q-PON Helper is a food coupon data-base management program that uses special routines to automate coupon selection, provide for automatic deletions of used coupons, and prepare printed listings. The result is a system that simplifies the use of coupons in sufficient numbers to have a significant impact on your weekly grocery budget. Now that's a program that's really user-friendly.

How about that new batch of coupons you've just snipped out of your Sunday paper? Q-PON Helper will prompt you to enter the information necessary to properly accept the new coupons into the existing data base. The program will automatically assign numbers by default unless you change it.

Basically, you will be requested to input (1) the brand name and generic description of the item, (2) one of 12 categories so your coupons can be sorted, (3) the expiration date of the coupon, (4) the expected cost of the item, and (5) the quantity you must purchase in order to use the coupon (sometimes you must buy several of an item to use a coupon). From this input, the program will compute the net cost of the item and the percentage of savings the coupon will earn. Once the system has captured the new data, you will be instructed to write its new number on the face of the coupon and file it numerically with the other coupons. Figure 2 shows a completed ADD COUPON transaction.

Coupons can be deleted if, for example, they have surpassed their expiration date or the relevant items are no longer desired by your family.

COMPLETED ADD COUPON TRANSACTION

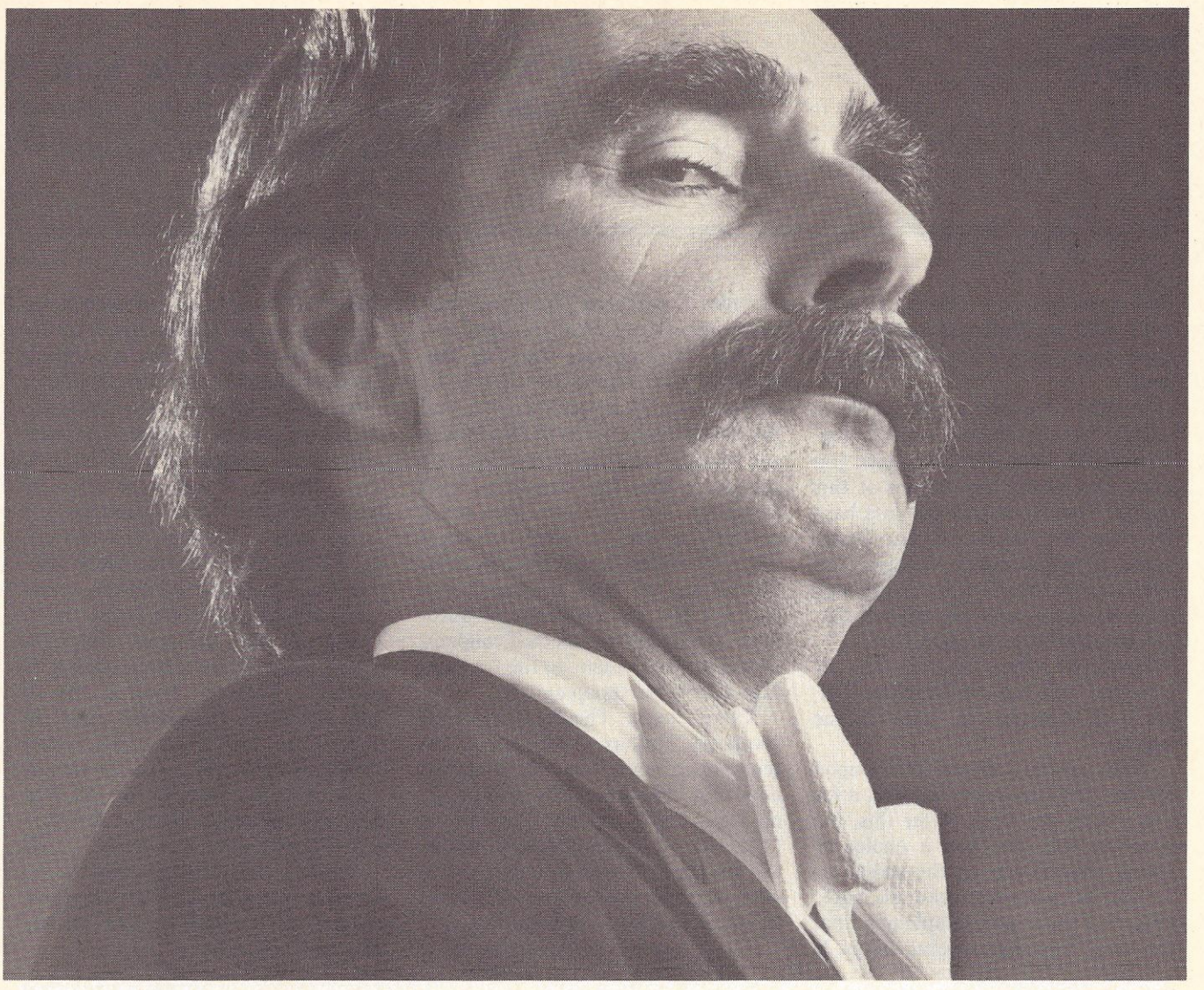
```
ADDING NEW COUPONS TO INVENTORY

COUPON NR. 5   NEW NR OR HIT RETURN:
BRAND NAME: JOHNSON'S
DESCRIPTION: DISHWASHER SOAP 1LB BOX
CATEGORY: (DA) DAIRY      (MD)MEDICINE
          (SN) SNACKS     (VG)VEGETABLES
          (FR) FRUITS     (CD)CONDIMENTS
          (MT) MEATS      (TO) TOILETRIES
          (ST) STAPLES    (BK) BREAKFAST
          (SO) SOAPS      (XX) OTHER
CATEGORY: SO
COUPON VALUE: .25
EXPIRATION DATE: 811231
EXPECTED COST PER ITEM: 2.00
QUANTITY PER COUPON: 1

NET COST: 1.75              % SAVINGS: 12.5%

ARE DATA CORRECT? YES
WRITE COUPON NR ON FACE OF COUPON
ADD ANOTHER COUPON? NO
```

FIGURE 2



A Case For Discrimination.

Discriminating computer users don't want the *best known* word processing software. They want the *best* word processing software.

Hewlett Packard, for instance, spent 9 months comparing 7 microcomputer word processing software systems—including the most popular brands—for distribution with the new HP125 microcomputer.

Hewlett Packard's conclusion: Spellbinder is superior to every other system evaluated.

The reason? Spellbinder's unrivalled ease-of-use and superior capabilities. Spellbinder requires fewer keystrokes for entering and editing text, and provides more flexible printing options without changing the way you enter text. Spellbinder and an inexpensive microcomputer easily rival dedicated word processing systems costing up to *three times* more.

In addition, Spellbinder offers features for mass mailing and for professional legal texts. The price also includes forms handling and "boiler plate" features to store and merge commonly used documents, forms, and paragraphs.

Best of all, Spellbinder's lofty capabilities are available at a very competitive price. In fact, some of the bigger names in word processing packages demand a much higher price, for a package with far fewer features.

Hewlett Packard wouldn't settle for less than Spellbinder. You should be just as discriminating. See your nearest computer dealer for a demonstration of Spellbinder. Or call Lexisoft at (916) 758-3630.

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CIRCLE 35

"With Q-PON Helper, one family cashed in on 124 coupons, saving almost $50 in one month."

Before the coupon is deleted, its contents will be displayed so you can make sure you are erasing the right data.

Q-PON Helper allows you to search for particular coupons, too. The search menu alone will give you some idea of the capabilities of this option. You can search the data base for a specific coupon number, brand name, item description, category, all available numbers (i.e., previously deleted coupons), or any coupon that has reached its expiration date.

Now that your coupons are all collected and beautifully organized, it's time to make that jaunt to the market.

First, you must review each coupon on file and either select or reject it for this week's groceries. After this, the program will give you a choice of seeing your listing on the screen or on the printer—you can do both. (Figure 3 shows an example of a final product.) This does several things. It provides a numerical listing of coupon numbers so you can manually extract them from your cache of coupons. It gives you a sorted list, by category, to aid in your shopping, and this sorted list is followed by totals so you can tell whether or not you are staying within the budget on this shopping trip. You can also see a category legend in case you forget what the codes mean. Finally, after the listing has been produced, you can opt for the program to automatically delete the selected coupons, or you can keep them on file for deletion after your shopping trip.

There's more. The READ/SAVE inventory options allow you to retrieve or store data in two sequential disk files. The first file contains the data base itself, while the second file holds the system parameters (that is, the number of records currently on file) that the program will need before it can load the data base.

There are several things to do to make Q-PON Helper an even more effective tool for saving money at the grocery store. First, if you are adding a coupon that has no expiration date, enter all 9's (999999). That way, the coupon will not be flagged as expired when it is compared with today's date. Second, if you want a list of every coupon in your inventory just for an informal review, you can use the PLAN SHOPPING TRIP routine to select and print all the necessary coupons; just don't delete them. Third, you may add more categories to the program by simply adding to the CC$ character string in line 10 and modifying the legend coded in lines 90 to 100. Fourth, by simply changing the order of the two-character category codes in line 10, you can get your printed output sorted in any category order you wish.

Editor's note: If you wish to receive a copy of Q-PON Helper, please circle number 335 on the Reader Service Card.

PLANNING SHOPPING TRIP—PRINTED OUTPUT LISTING

YOU WILL BE USING THE FOLLOWING COUPONS: 1 5 6 9 11 15 17 19 25 35 60 62 69 75

NBR	BRAND NAME	DESCRIPTION	CAT	EXPIRE DATE	ITEM COST	QTY	TOTAL COST	COUPON VALUE	NET COST
1	BROWNS	APPLE SAUCE	FR	821231	1.59	1	1.59	.35	1.24
5	CAROL	FRIED CHICKEN	MT	821231	2.79	1	2.79	.50	2.29
6	DUNBARS	PEAS	VG	820331	.69	2	1.38	.20	1.18
9	EMERSONS	SOAP POWDER	SO	830101	3.19	1	3.19	.50	2.69
11	CLINGLES	DISHWASHER LIQ	SO	831213	3.09	1	3.09	.35	2.74
15	CHARMING	TOILET PAPER	TO	820310	1.29	2	2.58	.60	1.98
17	BRUTUS	DEODORANT	TO	811231	1.66	1	1.66	.20	1.46
19	JENSEN	SHAMPOO	TO	821231	1.79	1	1.79	.25	1.54
25	TRYLONOL	ASPIRIN,	MD	820101	3.09	1	3.09	.65	2.44
35	CONTRACTS	PILLS	MD	820630	2.59	1	2.59	.50	2.09
60	HUNTERS	CATSUP	CD	830101	1.09	1	1.09	.20	.89
62	WONDERFUL	BREAD 10 OZ	ST	820301	.79	3	2.37	.30	2.07
69	DAIRYFUL	MILK 1 GAL	ST	821001	2.19	1	2.19	.20	1.99
75	PRICKLES	POTATO CHIPS	SN	821231	2.09	2	4.18	.50	3.68
TOTALS:					$27.93		$34.86	$5.30	$29.57

CATEGORY: (DA) DAIRY (MD) MEDICINE
(SN) SNACKS (VG) VEGETABLES
(FR) FRUITS (CD) CONDIMENTS
(MT) MEATS (TO) TOILETRIES
(ST) STAPLES (BK) BREAKFAST
(SO) SOAP (XX) OTHER

FIGURE 3



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CIRCLE 22

Calculating A Learning Curve— The Eighty-Five Percent Solution

Your guess on product pricing can be more on the money if you use a personal computer to find the relevant learning curve

by Thomas S. Fiske

The manager of a Cleveland-based plant was feeling hassled. He needed more business, but he didn't especially like the kind that his marketing group was supplying. His plant was geared for medium to large production runs of standard vacuum cleaners—however, he was getting more and more orders for small lots of special types instead. Fifty-five hundred was a small lot for him, but one of the most recent orders was for only 100!

"O.K.," he thought. "Times are hard. I'll have to figure something out. And after all, I do have a workable design for special types." But how could he fill the small orders in a cost-effective manner?

Something had to be done, and quickly, so the manager called his staff together to talk over methods of estimating. They decided that materials costs would be relatively easy to calculate. It was estimating labor hours that would be difficult, since operators had no experience with the new product. "Well, anyone got any ideas?" the manager asked. There was a long silence. Then a junior member of the group—we'll call him Rob Angell—spoke up. He had had experience with a local aerospace company, he said, and it had faced this kind of problem every day. He offered to think about the problem and come back the next day with some method of attack. This took the pressure off the staff, so they adjourned.

Thomas Fiske is a management consultant and programmer who lives in San Dimas, Calif.

Enter the personal computer

Angell, an industrial engineer, had something going for him besides his experience with a similar production problem. He had a personal computer and a printer at home. Old-line companies are often slow to get into the mainstream of computing, so employees who want that kind of help often get their own small units.

Angell had perceived immediately that the problem of estimating labor hours was related to operator learning rate. He knew that in aircraft companies, they'd long ago discovered that there was a rule of thumb about learning: Every time production doubled, the time needed for the production work was reduced by a certain percentage. When people are learning a new procedure, their proficiency increases rapidly at first and then levels off. This is referred to as the learning curve. Obviously, the time it would take the workers to produce the first unit would be much greater than for the last unit. The difference between the points of minimum and maximum efficiency represents the time-reduction percentage Angell was interested in.

What he had to do was to calculate whether or not the company would make or lose money, given the amount of time it would take to produce the total number of units and the amount the customer wanted to pay for the job. For this, he and his handy personal computer had to determine the relevant learning curve.

Angell also knew that, since marketing was probably going to continue to encourage and accept many contracts for small, specialized lots, any solution he came up with might be in use for a long time. If he could come up with some quantitative data, the boss would want to get all the mileage possible out of it. So he decided to use his personal computer to write a comprehensive program that would solve several related problems concerning the learning rate for new jobs.

Setting up the program

Textbooks said that the rates of time reduction were in the order of 80 to 95 percent, depending on the type of work being done. So with this information and some standard formulas in mind, Angell set up a four-part program for his computer. (The parts are enumerated at the top of figure 1).

According to the labor vouchers from accounting, Angell found that it took 101.43 hours to make the first unit. He also found from the marketing manager that the customer was expecting to pay a price that allowed for an average of only 15 hours per unit by the time unit 100 was made (1500 total hours). Angell entered these data into his computer, as

"How can you fill small special orders cost-effectively when your plant is geared for large production runs?"

shown in figure 1. The computer calculated that, given these figures, a learning curve of 75 prcent would be necessary. A curve of 75 percent was unrealistic; it would mean that the company would have only a marginal profit or could lose a lot of money. And that was no solution.

No dice

The next morning, Angell explained his conclusion to the staff. When they saw a printout of the computer calculations for the first 10 units (see figure 1), they agreed that they wanted no part of such a marginal arrangement with the potential customer.

With facts in hand, the plant manager told his marketing man that the company could not accept the order. But the marketing man had heard "no" before. "What *is* an acceptable deal, then?" he asked. "How can I make a counter offer?"

Fortunately, the boss had had the foresight to discuss this with Angell. The young engineer had experimented with Part 1 of his program and found that if unit 100 could be made in 34.5 hours, an 85 percent curve could be obtained. He checked himself with Part 2 of his program, as shown in figure 2. He and his boss agreed that this curve would at least keep the company from losing money.

At that point the marketing manager negotiated with his customer and they agreed on a new price—one that would allow for an 85 percent curve. (Of course, they did not talk about learning curves; they only negotiated about dollars.) Implicit in the agreement was an allowance for sufficient labor.

Right on target

The plant manager went ahead. He viewed the project with some caution, but at this point it seemed wise to accept some risks. "Could you use your program to see if the department is really on a curve, and if

FIGURE 1. WHAT DO YOU WANT TO KNOW? DO YOU HAVE:

```
1.  FIRST UNIT HOURS & SOME POINT WITH UNITS & HOURS
2.  AN ESTIMATED LEARNING (EXPERIENCE) CURVE
3.  TWO POINTS ON A CURVE BUT CURVE IS UNKNOWN
4.  3 TO 9 POINTS ON AN UNKNOWN AVERAGE CURVE

ENTER YOUR CHOICE? 1
WHAT ARE HOURS FOR FIRST UNIT (496)? 101.43
WHAT HOURS & UNITS DO YOU HAVE OR WANT (23,98)? 15,100
ARE YOU USING AVERAGE (1) OF ACTUAL (2) HOURS? 1
ARC TAN = 22 DEGREES AND 32 MINUTES.
YOUR % CURVE IS 75 AND THE SLOPE IS -.415038
DO YOU WANT HOURS FOR A UNIT (1), OR A RANGE OF UNITS AND HOURS
    (2)? 2
I HAVE ROOM FOR 100 DATA POINTS.
AT WHAT POINT DO YOU WISH . . . .
    TO START THE RANGE (453)? 1
    TO STOP THE RANGE (486)? 10
    TO STEP THE PROGRESSION (1)? 1

UNIT NO.    AVGE HOURS    TOTAL HOURS    ACT HOURS    75.0% CURVE
    1        101.430       101.430       101.430
    2         76.073       152.145        50.715
    3         64.290       192.870        40.725
    4         57.054       228.217        35.348
    5         52.008       260.038        31.821
    6         48.217       289.305        29.266
    7         45.229       316.604        27.300
    8         42.791       342.326        25.722
    9         40.749       366.743        24.417
   10         39.006       390.058        23.314
ANOTHER RANGE (Y/N)? N
DO YOU WANT TO START OVER? Y
```

FIGURE 1. It takes 101.43 hours to make the first new unit. The manufacturer wants to know what kind of curve is necessary if he gets unit 100 made in 15 hours (1500 hours for the first 100 units). His answer is a curve of 75%, which may not be possible. He then looks at the first 10 units to see their hours.

FIGURE 2. WHAT DO YOU WANT TO KNOW? DO YOU HAVE:

```
1.  FIRST UNIT HOURS & SOME POINT WITH UNITS & HOURS
2.  AN ESTIMATED LEARNING (EXPERIENCE) CURVE
3.  TWO POINTS ON A CURVE BUT CURVE IS UNKNOWN
4.  3 TO 9 POINTS ON AN UNKNOWN AVERAGE CURVE

ENTER CHOICE: 2
WHAT % CURVE DO YOU WANT (87.5)? 85
SLOPE IS -.234465
ARC TAN = 13 DEGREES AND 11 MINUTES.
ENTER HOURS & UNITS FOR A KNOWN POINT (23.98)? 34.5, 100
AVERAGE (1) OR ACTUAL (2) HOURS? 1
FIRST UNIT HOURS WERE 101.566
```

FIGURE 2. The 34.5 hours are checked against an 85% curve to see if they yield the known "first-unit" hours of 101.43. They come close, at 101.566.

"Every time production doubles, the time needed for production work is reduced by a certain percentage."

it's really anything like the job estimate?" he asked the young engineer. Checking with only two data points—unit 24 and unit 48—Angell used his computer for Part 3 of the program, to verify that the company was indeed proceeding on target (see figure 3). To the manager's relief, it looked as if they had their 85 percent curve.

After the run of 100 was over, the engineer went back over the collected data and entered more data points—Part 4 of the program. He knew that two data points indicate a trend, but several data points are more accurate.

Figure 4 shows the result of entering six data points. The average hours were entered, as opposed to the actual hours used in figure 3. (Part 4 of the program used only average hours, while Part 3 uses either actual or average.) Things looked good.

How he did it

In writing the program that made possible the "85 percent solution," the engineer (our Rob Angell really represents a composite of severel situations) encountered several problems about which the reader should be aware. The next few paragraphs describe them, as well as giving the formulas involved and the actual program, which was written for a TRS-80, Model I Level II. (A printer is not necessary.)

Average versus actual hours

Average hours per unit are the total hours divided by the total number of units. Actual hours, on the other hand, are simply the hours required to make a unit of production. Records may be kept either way, and the learning curve theory is adequate for either method. Figure 1 shows the relationship that is often given for average and actual hours. Actual hours are sometimes shown as (Average Hours) (1+N), where N is the numerical equivalent of the slope of the

(continued on page 154)

FIGURE 3. WHAT DO YOU WANT TO KNOW? DO YOU HAVE:

```
1.  FIRST UNIT HOURS & SOME POINT WITH UNITS & HOURS
2.  AN ESTIMATED LEARNING (EXPERIENCE) CURVE
3.  TWO POINTS ON A CURVE BUT CURVE IS UNKNOWN
4.  3 TO 9 POINTS ON AN UNKNOWN AVERAGE CURVE
ENTER CHOICE? 3
LARGE HOURS & THEIR UNITS (20,50)? 37.1, 24
SMALL HOURS & THEIR UNITS (15,100)? 31.4, 48


AVERAGE (1) OR ACTUAL (2) HOURS? 2
THINKING ABOUT IT


AV. HOURS ARE 48.0923 FOR 24 UNITS & 40.8916
    FOR 48 UNITS
ARC TAN = 13 DEGREES AND 10 MINUTES.
YOUR % CURVE IS 85.0274 AND THE SLOPE IS -.234
DO YOU WANT HOURS FOR A UNIT (1), OR A RANGE OF UNITS
    AND HOURS (2)? 1
WHAT NO. UNIT DO YOU WANT HOURS
    FOR (67)? 100


FOR UNIT NO. 100 . . . . .
AVERAGE HOURS ARE 34.4385 AND ACTUAL HOURS
    ARE 26.4106
```

FIGURE 3. The first test on the first run of the new product is made with two data points of actual hours from labor vouchers. An 85% curve is predicted, as well as a time of 34.4 average hours per unit by the 100th unit.

FIGURE 4. WHAT DO YOU WANT TO KNOW? DO YOU HAVE:

```
1.  FIRST UNIT HOURS & SOME POINT WITH UNITS & HOURS
2.  AN ESTIMATED LEARNING (EXPERIENCE) CURVE
3.  TWO POINTS ON A CURVE BUT CURVE IS UNKNOWN
4.  3 TO 9 POINTS ON AN UNKNOWN AVERAGE CURVE

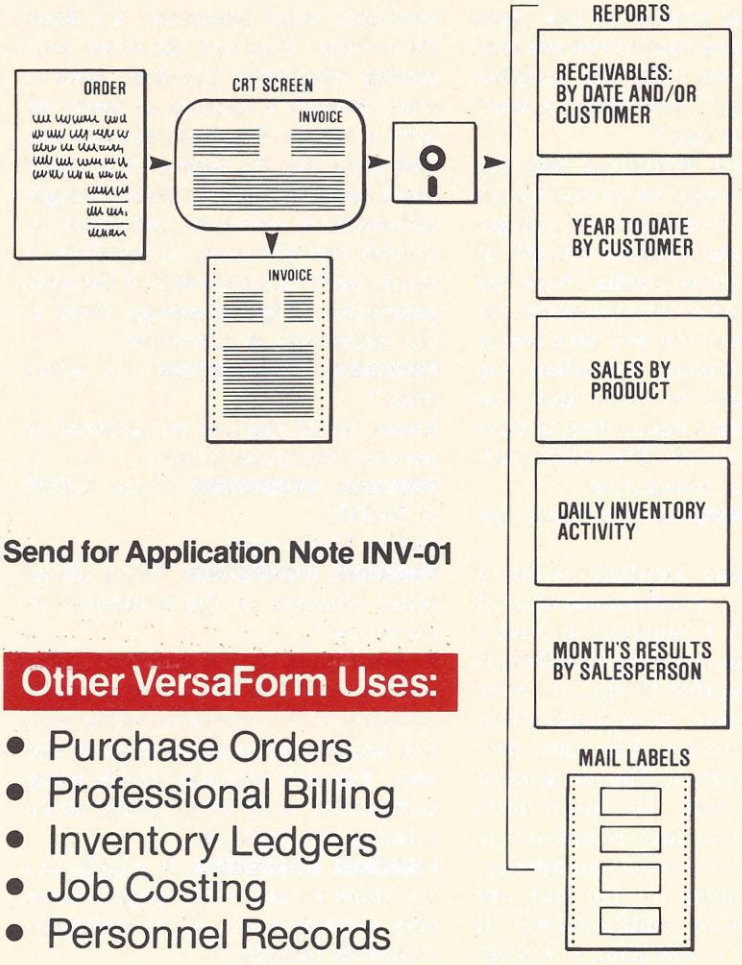
ENTER CHOICE? 4
ENTER HOURS & UNITS (0,0 TO STOP)? 35.5, 90
ENTER HOURS & UNITS (0,0 TO STOP)? 37, 75
ENTER HOURS & UNITS (0,0 TO STOP)? 39, 60
ENTER HOURS & UNITS (0,0 TO STOP)? 43, 45
ENTER HOURS & UNITS (0,0 TO STOP)? 50, 25
ENTER HOURS & UNITS (0,0 TO STOP)? 63, 10
ENTER HOURS & UNITS (0,0 TO STOP)? 0, 0

ARC TAN = 14 DEGREES AND 48 MINUTES.
YOUR % CURVE IS 83.2548 AND THE SLOPE IS -.264395
```

FIGURE 4. Six data points are entered to find the straight line (on log-log paper) that is the best fit to the points. An 83% curve works out best and shows that the company is on the right track. Only the accountants will know for sure.

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CIRCLE 28

INTERVIEW WITH BEN ROSEN

(continued from page 30)

Rosen: That's right. One of the trends we talked about was the 16-bit processor. The second trend is portability, in going from a small percent of the market to a meaningful part of the market.

PERSONAL COMPUTING: Is there a price barrier that we're looking at here for mass acceptance of personal computers?

Rosen: At the professional level, it's performance-driven and not price-sensitive. At the consumer level it's going to be a few hundred dollars.

PERSONAL COMPUTING: Under $500?

Rosen: The price is getting down there. Whether its the TRS-80 Color Computer, or the Sinclair ZX-81, or the Atari 400, or the Commodore VIC-20, or the Texas Instruments 99/4A. What isn't there yet is the friendliness or those latent needs we discussed. Those needs haven't been defined yet so the companies are offering machines that will entertain, teach computer literacy, do some simple functions.

PERSONAL COMPUTING: Like keeping a checkbook?

Rosen: Yes. They have not yet found a need that the consumer has that can *only* be done by the computer. What the consumer can do now conveniently and cheaply through conventional means won't sell computers. The classic example is keeping your menus on your computer. It is much easier to keep them on index cards.

PERSONAL COMPUTING: In a box?

Rosen: Yes. By the time you boot up the program, start a search and print it out, you could have found it in the index-card file. So what you have to do is sort of find the need that is not being fulfilled now through conventional means. You can't just duplicate what's being done.

PERSONAL COMPUTING: Have you put any thought into what that need is?

Rosen: Yes. But I don't know what the answer is. Everybody's thought about it. I think education could be one of the major things that pulls computers into the home. To teach courseware in the home is an adjunct to the learning process. A few years ago Radio Shack used to run ads that said: "Give your child the priceless gift of learning." Now who can resist a come on like that?

Encyclopedia Britannica was the master. Its strategy was to instill guilt in the parent. You know, are you going to deny your children this gift of learning, this encyclopedia? Now you have maybe one or two computers per school, and soon you will have one or two per classroom. But when you have a computer on every desk, you have the students demanding to have a computer at home. That could really broaden the penetration.

PERSONAL COMPUTING: Are there any other needs?

Rosen: The other possibility is that it might just be a combination of a lot of small needs. Computers do have a universality, so it's likely that there is no *single* thing that brings it into the home. You know, most applications are single-function. The auto provides transportation. The refrigerator keeps things cold. The stove heats things. The computer is unusual in that if it indeed becomes an application in the home, it's the only one that's going to be multifunctional. It will calculate, it will print, it will entertain, it will educate, it will deliver information services. There may be a perception that here is something that will do 10 little things and therefore is cost-effective and desirable.

PERSONAL COMPUTING: How do you define the next generation of personal computers?

Rosen: Something that changes and simplifies the interface between the user and the computer, and changes the way the person interacts with the computer.

I think that the Xerox Star is the prototype of the computer of tomorrow. It's a device that has high-resolution graphics. It has totally different software. It is different in the way one interacts with the programs. If you look at word processors on, let's say, the Star versus any conventional word processor, it's done differently. You can do word processing intuitively. You don't have to read through a manual to learn all sorts of things. You just point and cut and paste on the screen. It's much more natural. And it's done through advances in software, advances in display and advances in interface. I think that's characteristic of the next generation. The technology there is the technology of tomorrow.

PERSONAL COMPUTING: At what price?

Rosen: All of this can be achieved at personal-computer prices.

PERSONAL COMPUTING: From $2000 to $6000?

Rosen: That's right.

PERSONAL COMPUTING: What about other changes in the computer of tomorrow?

Rosen: I think that as each new computer is sold you will see less understanding of the computer, along with less programming being done by the user. You will see more people using computers to provide them some solution to a problem.

PERSONAL COMPUTING: It sounds like you think we are on the verge of some very exciting times in the personal-computer industry.

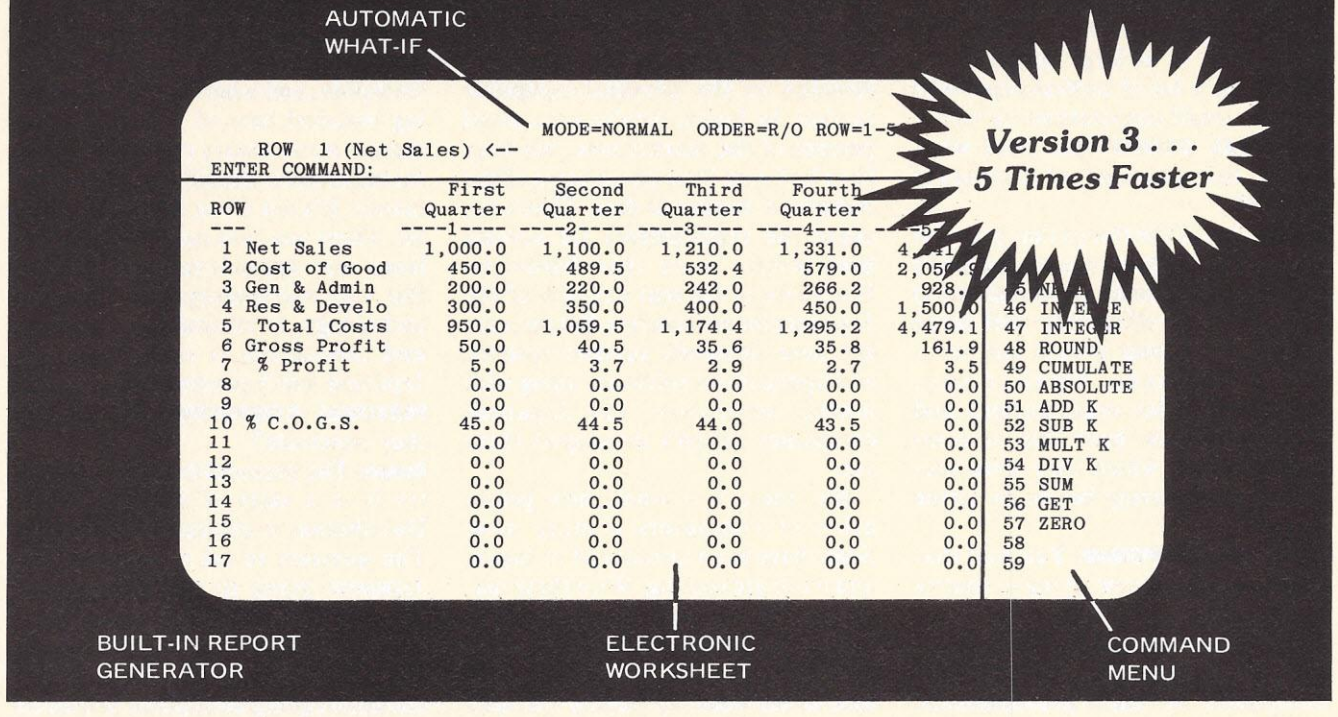
Rosen: We're still down at the bottom flat part of the exponential growth curve of the steep industry. We haven't even started up this part yet.

PERSONAL COMPUTING: What is happening with personal computers at the corporate level?

Rosen: What we're seeing now in large corporations is that they are trying to control all the personal computers being bought by their professionals. They're trying to centralize the purchases and thereby control them. Another trend along that line is we are going to see a lot more networking of computers in the large corporate environment, so users

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ROW	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	
	----1----	----2----	----3----	----4----	----5
1 Net Sales	1,000.0	1,100.0	1,210.0	1,331.0	4,641
2 Cost of Good	450.0	489.5	532.4	579.0	2,050.9
3 Gen & Admin	200.0	220.0	242.0	266.2	928.
4 Res & Develo	300.0	350.0	400.0	450.0	1,500.0
5 Total Costs	950.0	1,059.5	1,174.4	1,295.2	4,479.1
6 Gross Profit	50.0	40.5	35.6	35.8	161.9
7 % Profit	5.0	3.7	2.9	2.7	3.5
8	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0
10 % C.O.G.S.	45.0	44.5	44.0	43.5	0.0
11	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0

45 NE	
46 IN E E	
47 INTEGER	
48 ROUND	
49 CUMULATE	
50 ABSOLUTE	
51 ADD K	
52 SUB K	
53 MULT K	
54 DIV K	
55 SUM	
56 GET	
57 ZERO	
58	
59	

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CIRCLE 112

can share data bases and expensive peripherals and can communicate with each other.

PERSONAL COMPUTING: Isn't professional use in large corporations the fastest-growing portion of the personal-computer market?

Rosen: Yes, but I'm not sure how much of it is in large corporations. There are a lot of professionals who work in small corporations as well.

PERSONAL COMPUTING: And what about the question of corporate control?

Rosen: One of the things that personal computers are doing is allowing small businesses and small organizations to compete more effectively with large ones. Larger ones always had computer resources. Smaller ones haven't. Smaller organizations and individuals now have lots of computing power, which they were precluded from having before by virtue of costs.

PERSONAL COMPUTING: You said that corporations are now trying to control this resource. Should they?

Rosen: It's in the corporations' interest not to impede the use of personal computers by their professionals. And if corporations are attempting to control personal computers simply to standardize their use within the firm, and to take advantage of networking, that is also in their interest.

PERSONAL COMPUTING: In corporations, as in other environments, saving time is what personal computing is all about, isn't it?

Rosen: It saves time, but it also allows you to do things you would not have done otherwise. And it allows you to do some of the things you were doing before more cheaply. For instance, I publish an electronics-industry newsletter. Right now we're using word processors. A year ago we were using typewriters. It's much more efficient this way. A year ago I had someone plot graphs by hand. Now all the graphics are done with a plotter driven by the computer. A year ago all of the statistical tables were kept on spreadsheets and then typed by the typist. Today, all the statistics are kept on data diskettes and all the tables are formatted and printed by the computer.

PERSONAL COMPUTING: What do you foresee happening in the U.S. market with Japanese products?

Rosen: The Japanese are clearly interested in the personal-computer market. In Japan, they've got a small percent of the market now, but they have had very little penetration of the American market to date. That's because the requirements for success here involve more than hardware. Hardware is the real strength of the Japanese manufacturers. But the market here demands support systems and applications software, along with market sensitivity. The Japanese companies haven't developed these yet.

But there is a whole new generation of computers coming now. Some have been introduced in Japan, and more are coming. With these machines, I think we'll see these manufacturers getting over some of their problems. They can get around their lack of software by buying the software here for the American market. In fact, that's what is happening now—much of the software for computers from a number of Japanese firms is being bought from Microsoft. In fact, Microsoft has licensed MS DOS (the operating system used on the IBM Personal Computer, ed.) to 11 Japanese companies and 24 U.S. companies. So that takes care of the software-shortage problem. The last link in the chain is distribution in the U.S.—creating a brand name. I think the answer is that the Japanese manufacturers will be very active participants in the market, but that they will not dominate it.

PERSONAL COMPUTING: So what exactly do you see happening next year when more Japanese products become available?

Rosen: The large installed base among the trend-setting part of the population is unlikely to shift to Japanese makes unless they become disappointed with their present suppliers. I don't see a failure on the part of present American suppliers.

In an industry which is as innovative as the personal-computer industry, which is heavily software dependent, which is in a rapid state of transition, and where there is a growing installed base of U.S. machines, there is no necessary reason why U.S. manufacturers should lose their dominance. It's not a box like a television set, where you turn out five or 10 million a year. Japan is very good at that. But with microcomputers, where the technology is constantly changing and innovation is important, the Japanese won't penetrate that much.

PERSONAL COMPUTING: Where can they penetrate?

Rosen: The personal-computer industry is in a state of incredible flux. Distribution is extremely important. The question to ask is where are the Japanese going to get shelf space? With all these computers on the market now, and where a dealer can support only so many computers, who is the dealer going to displace to take on another line? That question has to be asked.

But I think the Japanese are going to be participating in the market. However, there is no reason yet to believe that they will dominate it.

PERSONAL COMPUTING: What about IBM dominance?

Rosen: It's hard to calculate share of market because the IBM Personal Computer is too new and the company isn't even up to full production yet. They will probably produce upwards of 150,000 computers this year. Apple will do 350,000 this year.

So that's roughly the perspective. Its Apple's fifth year and IBM's first full year. What's interesting is that Osborne will produce as many computers as IBM will. Osborne is a company with somewhat smaller resources than IBM, but price and portability sell.

PERSONAL COMPUTING: Who will be the market leaders five years from now?

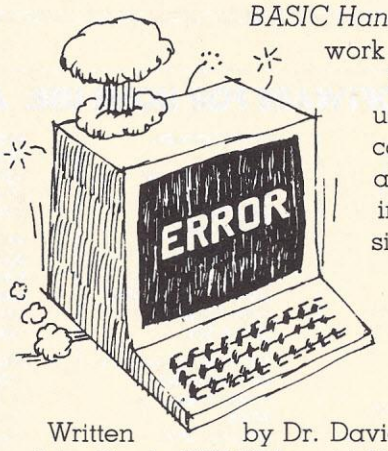
Rosen: I think the market probably won't look too different from the way it looks now in terms of who the majors are. The majors are Apple, Radio Shack and IBM. There are some companies that are at the low end that I think will continue to be successful, such as Atari, Texas Instruments and Commodore. I think you will have Osborne and Sinclair in their own niches. You'll add in one, two or three Japanese manufacturers with some intermediate share. There are some question-mark companies like Xerox.

PERSONAL COMPUTING: What does the personal computer look like five years from now?

Rosen: Gradually we'll see some of these new interfaces coming out on more products. We'll see much more friendly software—conventional—but much more friendly. I think there is an need for integrated software. You can have a data-base program, you can have a spreadsheet program, you can have a word-processing program, even by the same manufacturers. There is very little similarity among the three of them. It's very confusing to the user, though. Companies like VisiCorp have been trying to standardize. Micropro is trying to standardize from one of its products to another. But there is a long way to go toward integrated software. Radio Shack is going to bring out what could be a big breakthrough in software this summer. It is integrated software for the Model 16, where all the software you can buy—whether it's word processing, spreadsheet or accounting or whatever—is all in integrated packages using a common data base and standard interfaces for the user. I think that's going to be ubiquitous by 1985. And I think portables are going to go from a small percent of the market now to maybe 20 to 30 percent by 1985.

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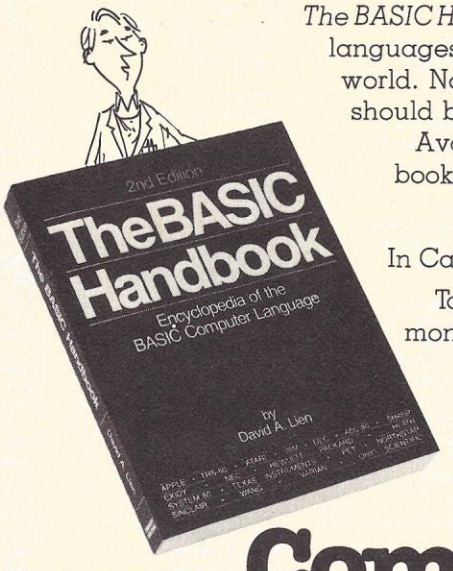


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CIRCLE 36

EDUCATIONAL SOFTWARE

(continued from page 52)

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Washington, DC 20003
(202) 544-4259
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Reading, MA 01867
(617) 944-3700
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Advanced Operating Systems
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Michigan City, IN 46360
(219) 879-4693
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Alpha Microsystems*
17881 Sky Park North
Irvine, CA 92714
(714) 957-1404
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APF Electronics Inc.*
1501 Broadway,
5th Floor
New York, NY 10036
(212) 869-1960
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Apple Computer*
10260 Bandley Dr.
Cupertino, CA 95014
(408) 996-1010
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Atari*
1196 Borregas Ave.
Sunnyvale, CA 94086
(408) 745-5227
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Automated Simulations
1988 Leghorn St.
Mountain View, CA
94043
(415) 964-8021
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Avant-Garde Creations
P.O. Box 30160
Eugene, OR 97403
(503) 345-3043
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Bertamax Inc.
101 Nickerson St.
Suite 550
Seattle, WA 98109
(206) 282-6249
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600 W. University Dr.
Arlington Heights, IL
60004
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Canon USA Inc.*
1 Canon Plaza
Lake Success, NY 11042
(516) 488-6700
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Comm Data
P.O. Box 325
Milford, MI 48042
(313) 685-0113
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(319) 353-5789
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Maynard, MA 01754
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(415) 525-9452
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Instant Software
Route 1
Peterborough, NH
03458
(603) 924-9471
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Stony Brook, NY 11790
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Portola Valley, CA
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Sunnyvale, CA 94087
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Math Ware/Math City
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Rolling Hills Estates, CA
90274
(213) 541-3377
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Mattel Electronics*
5150 Rosecrans Ave.
Hawthorne, CA 90250
(213) 978-5150
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McGraw-Hill Publishing
1221 Avenue of the Americas
New York, NY 10020
(800) 223-4180
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MECC (Minnesota Educational Computing Consortium)
2520 Broadway Dr.
St. Paul, MN 55113
(612) 376-1118
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Micro Computer Technology
3304 W. MacArthur Blvd.
Santa Ana, CA 92704
(714) 979-9923
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(312) 433-7550
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Suite 200
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(206) 454-1315
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Elk Grove Village, IL
60007
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NTS Software
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Rialto, CA 92376
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Ohio Scientific*
1333 S. Chillicothe
Aurora, OH
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Program Design, Inc.
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Greenwich, CT 06830
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Programs Unlimited Inc.
125 S. Service Rd.
Jericho, NY 11753
(516) 997-8668
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Radio Shack*
One Tandy Center
Fort Worth, TX 76102
see your local Radio Shack store or Computer Center

Santa Cruz Educational Software
5425 Jigger Dr.
Soquel, CA 95073
(408) 476-4901
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Scholastic Inc.
Scholastic Software
904 Sylvan Ave.
Englewood Cliffs, NJ
07632
(201) 567-7900
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Glenview, IL 60025
(312) 729-3000
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Redwood City, CA
94063
(415) 363-5472
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Software Technology For Computers
P.O. Box 428
Belmont, MA 02178
(617) 923-4334
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Chicago, IL 60606
(312) 621-0664
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(313) 595-4722
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*Denotes systems manufacturers. Software from these manufacturers runs on their proprietary systems.

being adapted from publishers like Scott Foresman and Scholastic Books. Texas Instruments uses its background in speech synthesis to create programs to teach children to read, and to teach math to children who can't read. The other computer makers are working on exploiting their machines' particular strengths, too.

There is already a lot of educational software out there, and more is becoming available monthly. These are just a few examples. So how does a parent find what he needs for his child in his community?

On the software trail

One method of approach comes from Cupertino, Calif., the home of Apple Computer. Perhaps not surprisingly, the Cupertino Union School District is a leader in educational computing. One of the district's computing leaders, Jerry Prizant, believes parents should start their search for educational software with the child's teacher. The coordinator of media services also believes that the teacher may know where the parent can find, locally, what's appropriate for his child. Even if the teacher doesn't use computers himself, he may know of a computing center in the school, or elsewhere in the district, staffed by people who can help. If the district has no computing program—and that's still likely—the next step is to go to the county superintendent of schools.

Jerry Wagman of Softsel agrees with this method. "In Los Angeles county schools, for instance, there are about 85 people who would know just what you were looking for. Why shoot in the dark? There is hardly an educator today who takes his job seriously who hasn't looked into computer-assisted instruction."

But even if there's no computer educational resources specialist in the school district per se, there's no reason to give up. The staffers of the county educational-media center

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RCA

CIRCLE 37

Birth of a legend.



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A whole new generation of Epson MX printers has just arrived. And while they share the family traits that made Epson famous — like unequalled reliability and ultra-fine printing — they've got a lot more of what it takes to be a legend.

For instance, they've got a few extra type styles. Sixty-six, to be exact, including italics, a handy subscript and superscript for scientific notation, and enough international symbols to print most Western languages.

What's more, on the new-generation MX-80, MX-80 F/T and MX-100, you get GRAFTRAX-Plus dot addressable graphics. Standard. So now you can have precision to rival plotters in a reliable Epson printer. Not to mention true backspace, software printer reset, and programmable form length, horizontal tab and right margin.

All in all, they've got the features that make them destined for stardom. But the best part is that beneath this software bonanza beats the

Uh...three legends.

heart of an Epson. So you still get a bidirectional, logical seeking, disposable print head, crisp, clean, correspondence quality printing, and the kind of reliability that has made Epson the best-selling printers in the world.

All of which should come as no surprise, especially when you look at the family tree. After all, Epson *invented* digital printers almost seventeen years ago for the 1964 Tokyo Olympics. We were the first to make printers as reliable as the family stereo. And we introduced the computer world to correspondence quality printing and disposable print heads. And now we've given birth to the finest printers for small computers on the market.

What's next? Wait and see. We're already expecting.

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FEATURE	ORIGINAL MX-80	GRAFTRAX-80*	ORIGINAL MX-100	MX-80 with GRAFTRAX-Plus	MX-80 F/T with GRAFTRAX-Plus	MX-100 with GRAFTRAX-Plus
Bidirectional printing	X	X	X	X	X	X
Logical seeking function	X	X	X	X	X	X
Disposable print head	X	X	X	X	X	X
Speed: 80 CPS	X	X	X	X	X	X
Matrix: 9 x 9	X	X	X	X	X	X
Selectable paper feed			X		X	X
PAPER HANDLING FUNCTIONS						
Line spacing to n/216		X		X	X	X
Programmable form length	X	X	X	X	X	X
Programmable horizontal tabs	X	X	X	X	X	X
Skip over perforation			X	X	X	X
PRINT MODES AND CHARACTER FONTS						
96 ASCII characters	X	X	X	X	X	X
Italics character font		X		X	X	X
Special international symbols				X	X	X
Normal, Emphasized, Double-Strike and Double/Emphasized print modes	X	X	X	X	X	X
Subscript/Superscript print mode				X	X	X
Underline mode				X	X	X
10 CPI	X	X	X	X	X	X
5 CPI	X	X	X	X	X	X
17.16 CPI	X	X	X	X	X	X
8.58 CPI	X	X	X	X	X	X
DOT GRAPHICS MODE						
Line drawing graphics				X	X	X
Bit image 60 D.P.I.		X	X	X	X	X
Bit image 120 D.P.I.		X	X	X	X	X
CONTROL FUNCTIONS						
Software printer reset		X		X	X	X
Adjustable right margin			X	X	X	X
True back space		X		X	X	X
INTERFACES						
Standard — Centronics-style 8-bit parallel	X	X	X	X	X	X
Optional — RS-232C current loop w/2K buffer	X	X	X	X	X	X
RS-232C x-on/x-off w/2K buffer	X	X	X	X	X	X
IEEE-488	X	X	X	X	X	X

*Tandy TRS-80 block graphics only available with GRAFTRAX 80.



CIRCLE 32

"The most fundamental problem is that most educational software is written by programmers who know nothing about pedagogy."

may know which teachers and districts are knowledgeable about computers. Or if there's a gifted student program at the district or county level, the people there could be helpful. Any group that gets outside funds or grants may have a lead.

Parents should also inquire about those teachers who work within a half-hour's drive of their home who know about educational software—and would be delighted to help. Even if the official sources listed above don't turn them up, local computer dealers may have customers who are teachers. The dealer can give the parent's number to the teacher. Teachers who have personal computers tend to have a missionary streak, and often they themselves are looking for parents in the community with whom they can ally themselves. So the parent who seeks out such a teacher will often find himself both giving and receiving assistance.

Other help

In some states there's also assistance at higher levels. The most famous example is the Minnesota Educational Computing Consortium (MECC), headquartered in St. Paul. The consortium serves school districts throughout Minnesota by helping them pool their resources and make volume computer purchases. MECC makes its materials available to its schools directly, and through manufacturers like Apple and Atari. Parents could use much of the software its participating teachers and specialists have developed for the schools.

Another way to find schools with computer-literate staffers is to ask the manufacturers and their dealers. Apple, Atari, Commodore, Radio Shack and Texas Instruments all have active educational-software programs, and IBM's Personal Computer Division appears to be following suit. Local dealers for these firms can put parents in touch with such resources, and most can help parents find nearby schools using their computers. Commodore's Downing, for instance, is compiling a list of hundreds of Commodore-using schools in America that have become resource centers for educational computing in their communities. He invites schools that want to join and parents who want the list to contact him. The same generally goes for the other makers.

School-wise dealers

At the dealer level, there are some firms like Unicom in New England that specialize in the educational field. If a dealer has expertise with education, that dealer will be selling to local school districts, and probably conducting seminars for teachers as well. And as Unicom has discovered, more and more parents are attending those seminars. The nearest schools using computers will know who such dealers are, and their teachers, purchasing people and/or computer specialists will be able to advise on how good that dealer is. Parents can call around, too, and ask dealers if they have educational specialists on staff. This could also lead the parent to schools nearby with computer-knowledgeable educators.

Dealers can also direct parents to local computer clubs and societies that may have knowledgeable members and/or staffers.

Commodore is exploring another means of disseminating information about educational software—national time-sharing services (like The Source and CompuServe). It plans to make public-domain software for its machines available through these services over the telephone lines. Commodore's Downing estimates this effort should be starting at about the time parents are reading this article.

Now parents have lists, recommendations, names of manufacturers of home educational software—with any luck, piles of information. How do they choose and evaluate any given piece of software?

Advice on judging educational software ranges from the holistic to the particular. Learning Magazine's Grady exemplifies the former approach. "If it's something that I thought my kid would need, I'd try it out. I wouldn't buy it if I couldn't try it." He believes parents know their child better than anyone else, and that they should keep their awareness of the child uppermost in their minds while checking out a piece of software. But Grady does have a specific recommendation about drill-and-practice software. He says it should create a framework, and fill that framework with facts. It shouldn't just shovel facts into the child's head. He points out that students leave high school today knowing a large number of facts. The problem is that they often can't use the information—they can't think very well. So he recommends courseware that teaches children how to think.

Evaluating it all

Stefan of Edu-Ware leans toward the particular. He has seven points parents can use to evaluate educational software.

- Are there clear learning objectives? Stefan believes that if the learner doesn't know what he's expected to learn, he has no way of knowing whether he's learned what the parent wanted him to. Once he does know, he begins to manage his own learning. He will determine what he needs to do to acquire a given skill. Stefan says a child should learn not only the information, but also how to identify his own strengths and weaknesses. He can then ultimately make career choices based on accurate self-assessment. So here Stefan agrees with Grady.
- How friendly is the software? Reading a book, one has only to turn the page to get the next bit of information. The index and table of contents make it simple to seek out categories of data in the book. A computer program that doesn't make it as

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CIRCLE 39

"Educational software works because a computer has the patience only the truly mindless can achieve."

easy—or easier—to get to the information is hardly an improvement over a book. Stefan advocates software with single-keystroke menus, which means the user has a menu, or a list of choices, on the screen, and presses a single key to get into that particular choice-area.

Clear instruction needed

The program should show the learner very clearly what he needs to do to get to the information in the program. If it's presented in "pages" or frames, with simple keystrokes turning those pages, the software will work in a familiar way. The visual display—the amount of information shown at any one time—shouldn't overwhelm the child. And if it's math that's being taught, for example, the child's limited reading skills shouldn't get in the way of his learning math.

- Is the information presented so the learner can easily assimilate it? Stefan puts a boundary around every screen display because he thinks it tends to contain eye movement and attention. He also includes a heading at the top of each screen so the learner knows, in one or two words, what's going to be presented on that page.

The information should conform to the child's reading level, of course. It helps to have everything in upper- and lowercase, which can be done in hardware or software, depending upon the computer. Stefan thinks uppercase-only degrades the ability to interpret written information, so the display should include all the cues found in printed matter to aid comprehension—capitalization, punctuation, underlining, boxes and the like. Here once more, the computer should work at least as well as a book.

- Does the software use color for cueing and motivation, as well as animation, and graphic illustrations where appropriate?
- Does the software provide reinforcement? Reinforcements tell the learner that some practice activity he's engaged in is correct. Or if it's not correct, reinforcement provides the correct answer. Negative reinforcement should be quite neutral. If it says, "wrong you dummy," it's very harmful. Positive reinforcement shouldn't be condescending. Stefan says kids find "Gee, Johnny, that was good information," very offensive. He also opposes anthropomorphizing the computer. Small children are still learning to distinguish between animate and inanimate, while older kids find it silly. So his programs never say, "Good morning, I'm Mrs. Apple."
- Does the program have branching? Any program should deal constructively with a child who gets something wrong repeatedly. He should be branched in some way to new instruction, or to a repeat of previous instruction, before he goes on to the next task. And the branching should be automatic—the child shouldn't have to ask for it.

Tailor the software

- Is the software flexible? The parents should be able to adjust the paramenters of the program to fit their child's specific skills and needs. For example, in a series on fractions there may be six different skills being taught. Parents may not want the child to select any of them at will; they may want a certain sequence, especially if that sequence fits the way fractions are being taught in school. Parents may want to have the child pass a test with a score of, say, 80 percent, before letting the child tackle the next unit. And how many times do parents want to let the child get a wrong answer before the program loops into a branch? That can only be determined by people who know the child's frustration level. So home educational software should include a learning manager subprogram an adult can set, which the child never has to deal with. There could be several dozen ways the program should be tailored to a child's particular needs. It can then be retailored as time goes on, or as different children use it.

Although these points are aimed more at drill-and-practice software than at simulations, some points have more general applicability. TI's Walker also focuses on drill-and-practice software in her advice. She stresses that a child should be able to use the program by himself, with very little parental help. Programs should be self-explanatory. She adds that the plug-in modules several firms offer help with young children, because they're hard to break and easy to insert into the computer. And also for younger children, she recommends programs using speech synthesis and visual reinforcement. Manuals should accompany programs but the child should be able to use the program without the manual—it's there for the parent, or should be. This advice on selecting software dovetails with a piece of advice she has for parents, too. She thinks parents should not try to instruct children too much. The kids will enjoy it a lot more; the more they are allowed to do it themselves, the more they'll enjoy learning with the computer. Parents should be available if children get bogged down.

Make it real

Downing of Commodore offers some pointers for evaluation, too. The first is documentation, a problem with all kinds of software. Next, he thinks it would help parents' judgment if the program included a pretest that would let the program itself suggest the proper level of difficulty. Finally, he wants to know if the software is being used in the schools. It doesn't necessarily mean it's bad if it isn't, but teachers using it could help parents evaluate it. And he agrees with Stefan on the importance of reinforcement of the right sort.

With simulation programs, Downing wants the program to present

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CIRCLE 40

"No one ever reads text books unless he has to. And courseware often follows suit in its dullness."

real-life situations, as does Lemonade Stand, a kind of grammar-school/ Harvard Business School case study. It has students making the same kinds of decisions about buying and selling that they'll use in later life. He thinks simulations should force real-world decisions, and give feedback about the quality of that decision to help the child better himself. He'd also like to see simulations the child can play with parents, that would foster interaction between them.

. . . Or fantasy

Krell Software's Friedlander, on the other hand, has no objection to fantasy games if they help children deal with complex decision-making environments. This is a point on which people disagree sharply. Perhaps it should depend on whether the child seems able to relate processes learned in fantasy simulations to real-world situations. And perhaps this is an area where parents can help a child apply his educational experiences to real-world ones.

Friedlander offers a subtle point on the topic of reinforcement. He thinks some children thrive on much sterner reinforcement than others who may work best with nothing but positive strokes. He likes programs that not only catch mistakes but analyze them for patterns, which helps the child understand how he made the mistake, and not just that he made it. He also feels that both the subject matter and the problem-solving procedure being taught are important and need to be evaluated.

In addition, Friedlander points out that a program may tell a child he's wrong when he's right. Suppose the program shows the outline of a cube. If the child calls it a group of lines, is he wrong? The student may know it's a representation of a cube, and that representations differ from things themselves. So parents need to watch out for narrow vision in the design of a program's reinforcement and branching. Learning's Grady makes a similar point. Any program's branching, he notes, has to be based on probabilities, not certainties. It has to assume the child made a mistake for certain reasons, which require certain corrections or reviews of previous material. If the child made a non-average mistake, then he may wind up worse off than if he hadn't used the software.

Just what constitutes real-world relevance is the subject of some dispute. Prizant from the Cupertino Union Schools mentions Eastern Front, an Atari war simulation game that duplicates the Eastern European theater in World War II. Those few children who will become soldiers will certainly find it directly relevant to their education, but children who become managers in competitive businesses may not be far behind! Prizant adds another advantage of drill-and-practice software, too. If it incorporates a management system that records the child's performance, parents can review that information after the child has used the program. This allows them to keep track of what the child is doing, and the computer no longer functions just as an electronic baby sitter.

Dr. Ann Piestrup, The Learning Company's founder, says software should spring from an understanding of the child's motivations. The software has to have intrinsic motivation, especially if parents want something profitable to happen during vacation periods. Ideally it combines the excitement of PacMan with the logic of electronic-circuit design. She probably mentions that example because her company has an educational game called Logic Gators that does just that. The child comes out knowing something about logic design.

She says that programs for younger children should encourage them to practice over and over by being playful and success-oriented, and by changing in some way each time the child plays them. This helps the child to become an independent learner and to master the subject material.

Piestrup adds that graphics, color and sound should be used in meaningful ways, and not just as decoration. In Logic Gators, for instance, gates turn red when they're on and white when they're off. They're also designed to allow color-blind children (many boys are) to make the needed discriminations.

Kids as programmers

Piestrup thinks children should learn programming, even if the parents don't know the subject, and should also learn to use simple word processors like Apple Writer. This can have remarkable consequences. She says her company's program Moptown had its graphics done by an 11-year-old girl who's receiving royalties on the program. Piestrup also knows one 13-year old making $30,000 a year in royalties!

Piestrup favors programs that teach thinking and problem-solving over drill-and-practice. She says many of the drill programs are boring, although they can be effective. So while they may be appropriate to a structured school environment, a student might find them less than thrilling on a warm summer afternoon.

She also takes exception to programs that associate problem solving with time limits. She thinks making solutions time-dependent may not teach problem-solving skills correctly. There seems to be no unanimity among courseware specialists on this question.

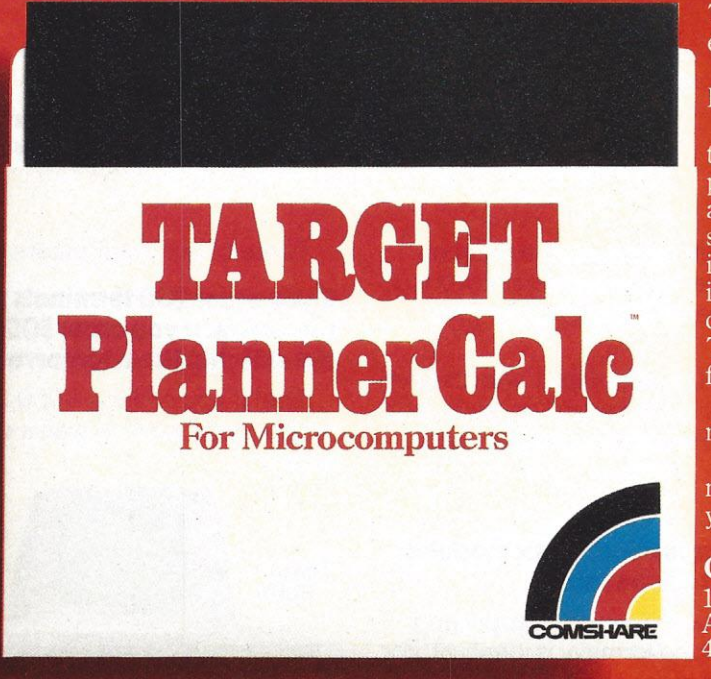
Productivity software

Evaluating productivity software is done just the way parents do it for themselves. This is an area where dealers can help, because it also falls under the category of business software. Piestrup offers an interesting example of how this kind of software can unlock potential. A computer

(continued on page 114)

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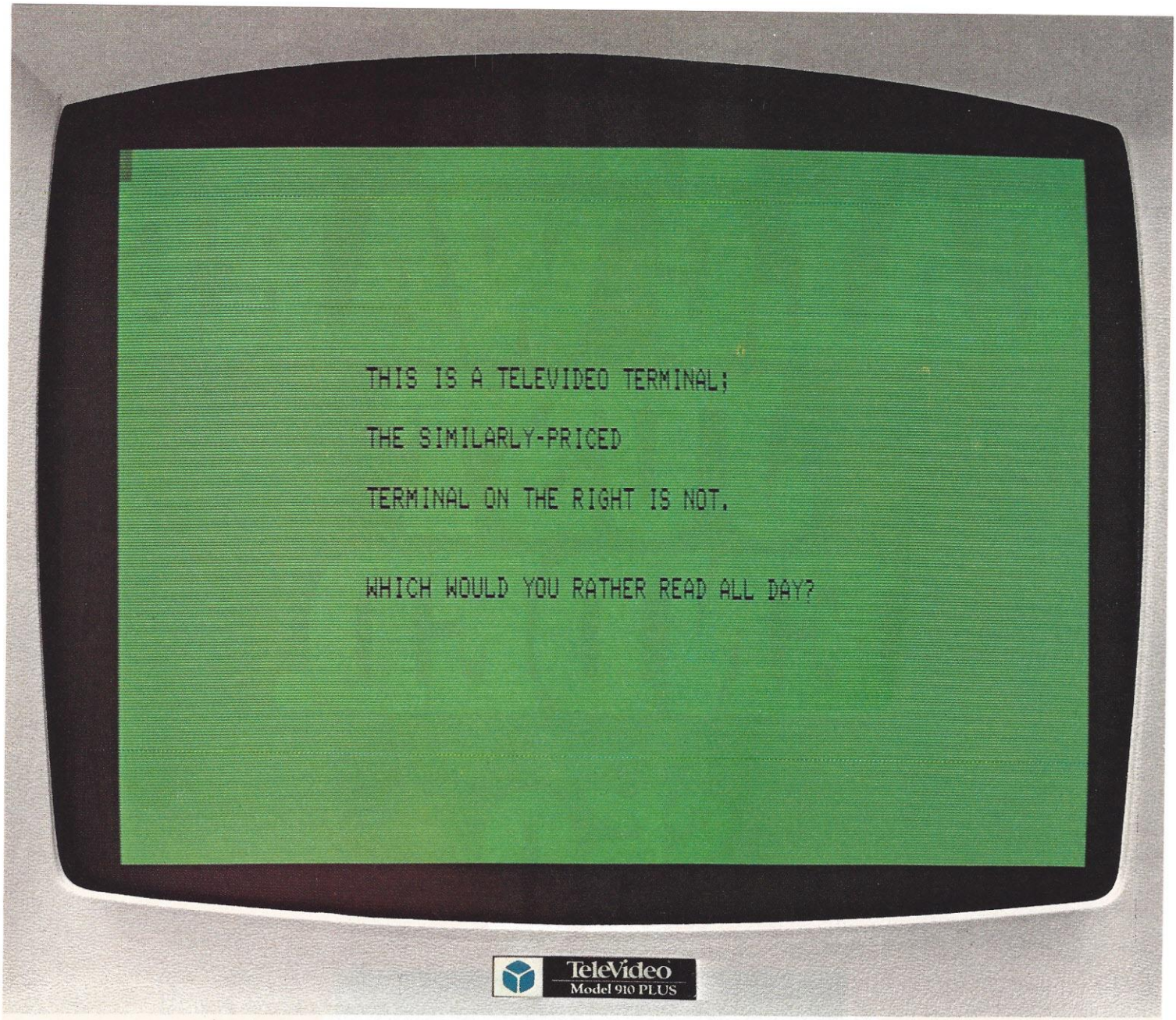
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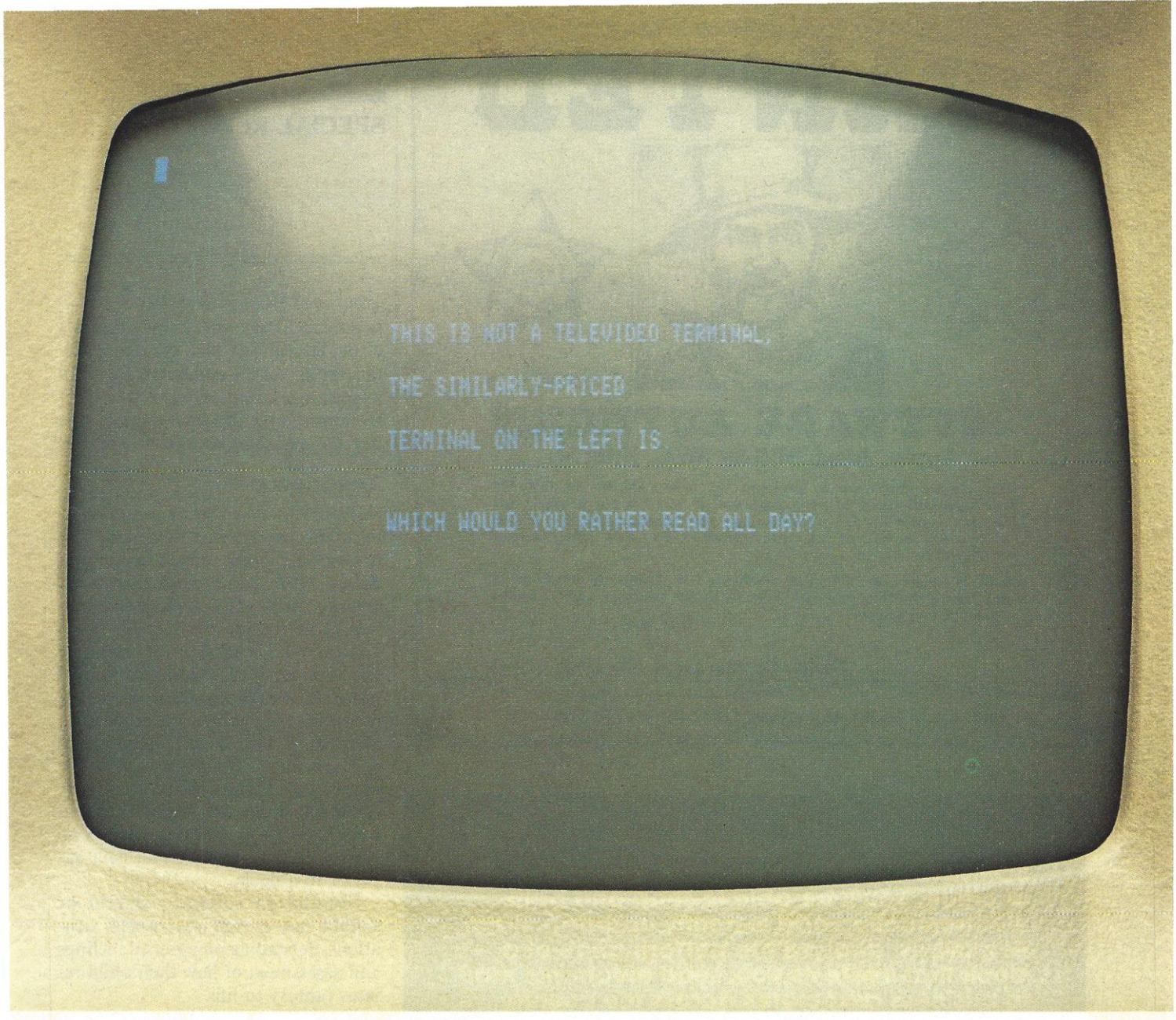
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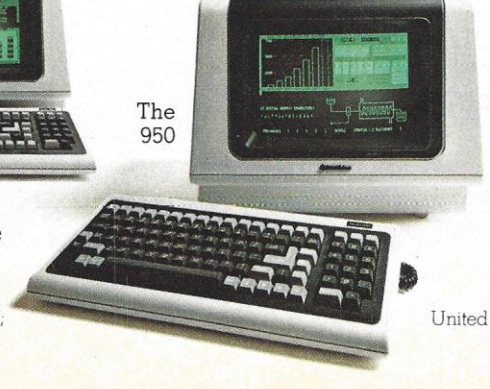
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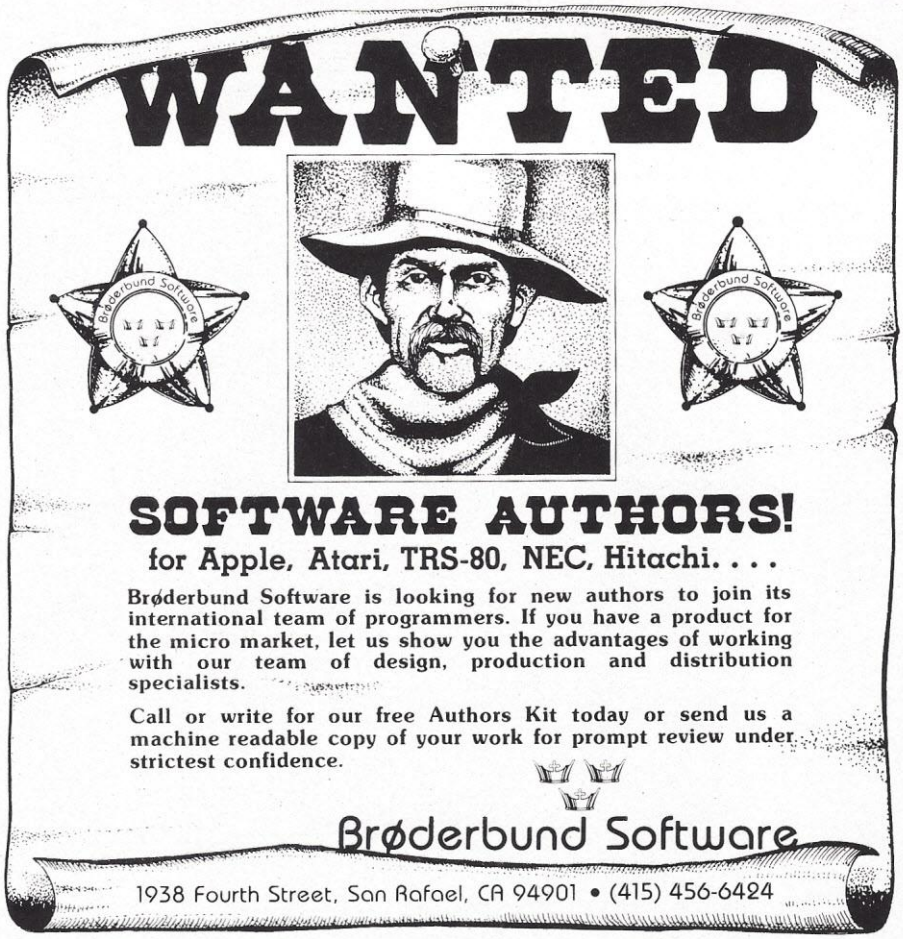


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CIRCLE 45

(continued from page 110)

graphics artist she knows doesn't draw at all; yet she creates spectacular art on the computer. Piestrup hypothesizes that the girl is a perfectionist, and the computer allows her to make mistakes disappear.

Some clear goals

So from this disparate chorus of opinions, how can parents figure out how to evaluate home educational software? Well, some consistencies do emerge. Drill software should be customizable for the child's skill levels and emotional character. It should be fun, yet establish clear educational goals. It should also have documentation for the parent's use at least. In addition, it has to have appropriate reinforcement. It should exploit the unique capabilities of the computer. After all, books are inexpensive and have many good qualities. There's no reason to buy software that isn't superior to a book.

Simulation software should or should not match real-world situations, depending on parents' feelings and assessment of how their child relates fantasy to life.

Simulations should or should not pit the child's reasoning against the clock. It could be asserted that a skill should be mastered without ticking in the background, but once acquired, it could be refined with time requirements. After all, real life is full of time limits. Some simulation software should allow parents and child to play together. And there should be ways of saving drill and simulation sessions for later review. And some pure game software may have educational possibilities that the parent could exploit, perhaps aided by a computer-literate teacher.

As a last resort, parents can follow the example of Piestrup's 13-year old friend and design their own programs. If they do, there are people at all the personal-computer houses and most of the software houses who'd love to hear from them!



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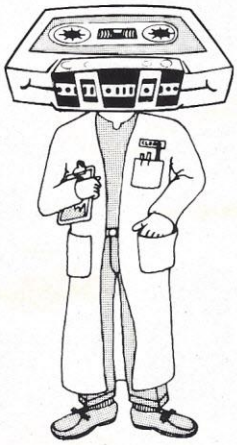


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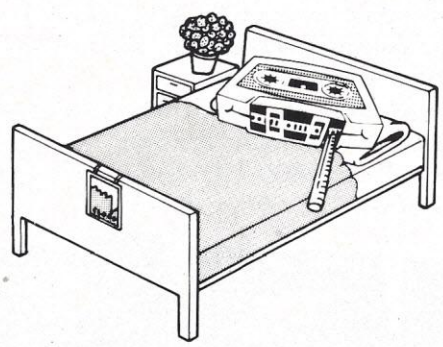
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CIRCLE 46

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CIRCLE 47

BURN-OUT ANTIDOTE

(continued from page 46)

have the time or inclination to go back and question your assumptions or try another solution. You feel as if you're putting in 10 hours a day just to survive—and that's stressful. When you don't have to spend hours crunching numbers, you can look at more possibilities. You come out with the awareness of having done a very complete job."

Someone just starting to use a computer on the job should give careful thought to the amount of time he wants to spend with it, Winters cautions; the machine's seductive qualities can infringe on office time.

"Mastering that machine is a lot of fun," he says, and adds that the programming experiments he's pursued for pleasure turned out to be valuable for business as well.

The portability of personal computers can also play a part in relieving the strain of high-pressure occupations. People who have a hard time leaving work stresses on the job run a high risk of burnout, and for them, the possibility of carrying a large piece of the office home in a personal computer may seem like a danger.

But Freudenberger sees it, instead, as a chance for the busy executive or professional to carve out more time with the family. One patient, an attorney, invariably has at least four hours of work every weekend requiring the help of a computer. In the past, that meant spending a good part of every Saturday at the office, or going there and back. Now he does his weekend work at home on a personal computer linked to the company's mainframe. And in the summer, he takes the computer to his beach house, wraps up his business early on Saturday morning, and has the rest of the time for relaxation. Since the man was unwilling to cut back on his workload, the home computer represented a healthy compromise: a few hours at the keyboard for a weekend at the beach.

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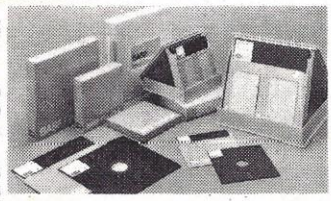
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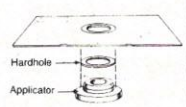


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CIRCLE 127

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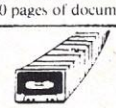
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All programs are menu-driven and allow add/change/delete. Also, all files and statements can be listed to screen or printer, and saved to cassette or diskette. The cost of THE COLOR ACCOUNTANT is $75 for cassette and $80 for diskette. This package requires 16K except for the ATARI 400/800 which requires 24K for cassette and 32K for diskette. THE COLOR ACCOUNTANT also comes with 40 pages of documentation.

the programmer's program



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*All software available on cassette for ATARI 400/800, APPLE II+, MODEL I, III, COLOR. On diskette for ATARI 400/800, APPLE II+, MODEL III.

CIRCLE 50

BUSINESS

MAIL DELIVERS

(continued from page 40)

manufacturers are apparently beginning to make eyes at this field. A Tandy Corp. official says that the company plans to market electronic-mail software for its TRS-80 Model 16 this summer. Moreover, one executive at a software house, who has kept a close watch on electronic-mail developments, says he expects Apple and IBM to release comparable programs of their own.

Out of the shadows

A good deal of this interest stems from a growing belief that electronic mailing on the personal computer is about to come out of the shadows imposed by mainframes.

"We're targeting a whole different market with Transend III," Wertzberger says. "We have to convince Fortune 500 companies that the personal computer now has the capability to perform satisfactory and economical electronic mail for them."

Although many refuse to term it true electronic mail, the mailgram, now updated to include sending text by personal computer, is considered by some to be an interim alternative. Western Union is still the leader in this area, but The Source is developing a similar system whereby subscribers will be able to type a message into the data bank and have hard copy delivered to one or many addresses within a day. One of the most hungry new competitors of these services is the United States Postal Service, which started a system called E-COM (Electronic Computer Originated Mail) in January.

A personal-computer owner who wants to use E-COM has a choice of two methods: He can either obtain certification by developing the software and message format that would enable his machine to communicate with E-COM's, or he can sign up with one of the so-called dedicated carriers. Dedicated carriers are firms that have already completed certifi-



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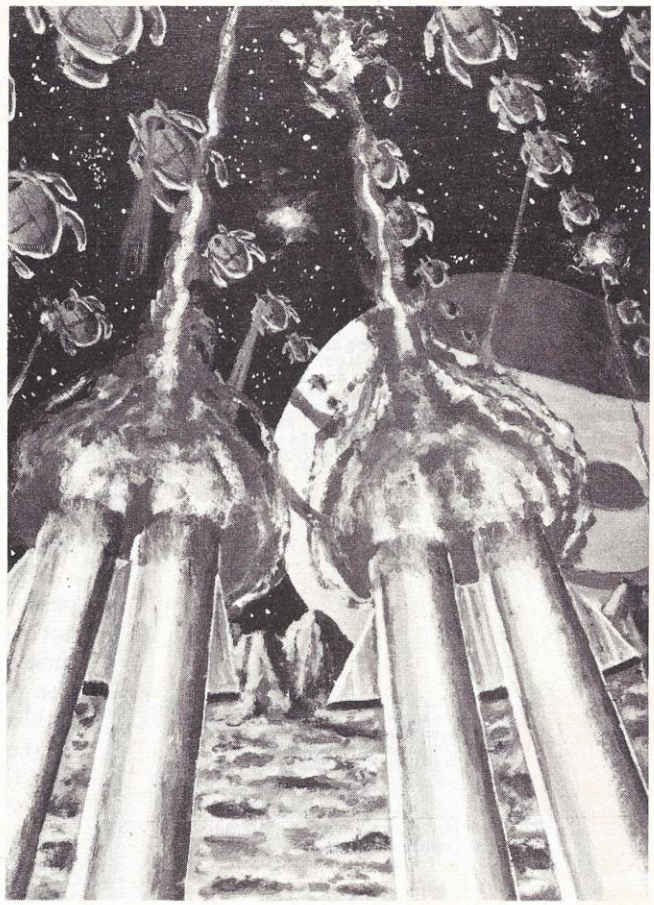
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CIRCLE 153

MOONBASE IO

• the battle for the moons of Jupiter •



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Moonbase Io combines three exciting arcade adventures in one exciting game. The machine-language program by John Konopa uses advanced graphics and sound effects. Action is fast and exciting — varying levels of skill required to go from one part of the game to the next.

BEYOND SOFTWARE's arcade-adventures are the next generation in computer games for the ATARI™ computer. A voice-activated program will help you meet and overcome the challenge — it may be an alien invasion, a fiendish murderer preying on a country village or a treasure trove buried deep in the shark-infested sea.

Moonbase Io is available at fine computer dealers. Or, directly from PDI for $29.95 plus $2.00 shipping and handling.

Requires 24K ATARI™ computer with disk and cassette.
Cassette version available soon.

PDI

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CIRCLE 152

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CIRCLE 49

cation, and thus are licensed to serve as middlemen in transmitting a customer's message to E-COM.

A customer who either uses a dedicated carrier or who has E-COM certification is led through his message writing by a carefully constructed menu program, again like the typical electronic-mail procedure. Under E-COM's set-up, a customer not using a dedicated carrier must direct his message to at least 200 addresses. After the message is received by the computers at one of 25 regional E-COM postal centers, it is converted into hard copy, put into the normal first-class mail flow, and delivery is promised within two days.

For smaller businesses that have personal-computer systems but do not need to mail 200 messages at a time or want to endure the certification process, dedicated carriers such as Netword, (Glenn Dale, Md.) may be the answer. Though many critics of E-COM claim it is slow, unwieldy, and rife with planned obsolescence—because true electronic mail will soon dominate the sending of business letters—Nancy Guetzkow, Netword's president, is not impressed by this argument.

"Most businesses send 50 percent of their mail to the public," says Guetzkow. "And though it may be common within four or five years to see computers exchanging messages in business life, regular mail to the general householder will continue for at least 10 to 15 years."

Satisfactory business tool

There are many that strongly agree with her. Peter McCarther, a vice president at Heritage Wisconsin Corp., a bank holding company in Milwaukee, has been using E-COM on the firm's personal computers since January and asserts that it has been a very satisfactory business tool.

"Our first basic mailing," McCarther says, "informed the public that Heritage was 'the first in the Midwest to use E-COM, now why

don't you invest in our IRA plan?' We sent out 2800 letters throughout Wisconsin and northern Illinois quite cost-efficiently and got good results. Using E-COM identifies us as a forward-looking concern.

"In the long run people will probably do away with much of their paperwork," he continues. "But there will always be a place for hard copy, and the Postal Service will probably always be the major deliverer of that copy. In a sense, E-COM is simply improving that service and making it available to those who own personal computers."

The Postal Service is still sticking to its original projection of 20 million messages a year—400,000 per week—despite a disappointing first six months during which E-COM has only processed an average of 3000 messages weekly.

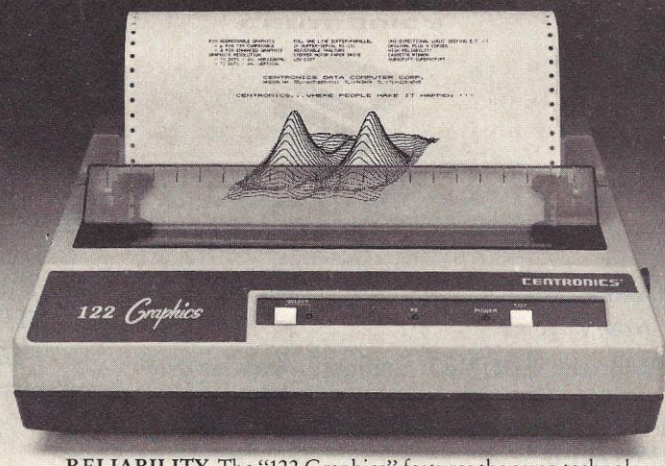
New parlance emerges

There is a curious sidelight to this story. As electronic mail grows in importance, a new language is sprouting up among managers and executives who send electronic-mail messages. Nancy Beckman at The Source describes it as an electronic shorthand, a "mixture of being very informal and to the point."

And many who are working with electronic mail maintain that this fundamental shift in the way a business letter is written, where the formal, stilted style is giving way to shorter and less rigid messages, represents an important passage in the way personal computers are affecting corporate life.

"This may not be the end of the written word," says one executive. "But it is a new type of communication among people that will revolutionize our concept of business letters. That's how you know electronic mail will succeed in becoming a part of corporate life. It has a built-in efficiency and time-saving factor, and before long no corporation will be able to ignore that."

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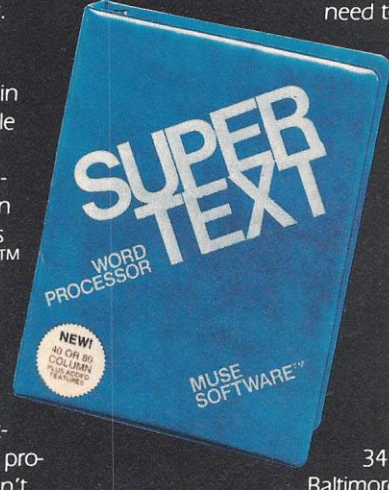
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CIRCLE 59

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CIRCLE 60

FUTURE GAMES

(continued from page 72)

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2. MATHWORLD
3. ANIMATED SYMBOLIC LOGIC
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(1 2 3 4 5) :2
ARCADE GAMES
YEAR?1982

ARCADE GAMES:1982

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(1 2 3 4 5) :2
ARCADE GAMES
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ARCADE GAMES: 1990

1. RESULTS OF BOSTON-WASHINGTON ARCADENET TOURNEYS
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Now you can use RACET's Hard/Soft Disk Operating System (HSDS) with the ARM Winchester Disk Drive on the Model II. This cost effective combination provides 15 Megabytes per drive **including ECC Error Correction Code** and an advanced sequencer to further ensure data integrity. An incremental backup to floppy is provided so that only those **sectors** that were changed from the last backup are saved. A full monthly service contract is available at $30 per month per drive.

The HSDS Software has more than One Year's FIELD Experience. The latest HSDS version adds several enhancements including maintenance of system files on the hard drive, files as large as the disk, the ability to segment the disk as logical drives, definable directory size, and many utilities including bulk copies between floppy and hard drives, multiple purge, Superzap, and Directory Catalog System. Full program compatibility with TRSDOS 2.0a is maintained. Mixed floppy and hard drive operation is supported.

HSDS is available for the Cameo, Cynthia Bull, Corvus, Data Peripherals, and Santa Clara Systems hard disk systems as well as the ARM Winchester Drive.

ARM 15 Megabyte Drive Subsystem $3895. HSDS Software $400.
Cameo 5/5 Cartridge Drive $5995. Cynthia Bull 10/10 Drive $7995

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5 to 10 times faster backups!!! Full disk backup (including verify) 55 **seconds!!!** on two drive system — 2:15 on single drive system. In business, time is money, and one BACKUP is worth 1000 tears!!

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ISAM File Structure — Multi-Company Capability. Modular structure. Each module includes complete user documentation which guides the user through installation and allows "practice" using a sample data base. When ready, the user simply names his data base and begins. The Integrated Business System program set includes General Ledger, Accounts Receivable, Accounts Payable, Payroll, Inventory, General Journal, Asset Management and more.

Business Programs $250/module Mod III, $300/module Mod II, $795 for all four Mod III, $995 for all four Mod II. General Ledger and Accounts Receivable available now. Accounts Payable and Payroll 1st Quarter 1982.

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CIRCLE 52

GET THE MOST FROM YOUR NEC PC-8001 WITH RACET COMPUTES SOFTWARE!!

RACET NECDOS $175

RACET NECDOS does more for your PC-8001 than any other DOS. It's faster, more efficient and easier to use. It's loaded with extra features to let you stretch the limits of your system. This advanced operating system works with the ROM NBASIC to give full compatibility with color and other BASIC commands.

USER FRIENDLY — Emphasizes Integrity. No MOUNT or REMOVE commands!!! Excellent protection from improper diskette swapping. AGAIN, HELP, FIND and REF commands. File password protection.

ADVANCED DESIGN. RACET NECDOS utilizes the computer in the 8031 for most disk I/O functions minimizing memory utilization in the PC-8001. The Dynamic Transient Area (DTA) allows multiple transients to be scatter loaded and relocated in memory simultaneously. This unique capability optimizes use of valuable memory, yet provides an almost limitless growth potential.

ADVANCED FEATURES. All DOS functions and commands may be used directly in a BASIC program!!! Special RUN option allows merging of programs, retaining all variables in memory. Fixed block spanned records. AUTO and DO commands. Machine language loads and saves. MATPRINT and MATINPUT to disk. Complete directory. **ALL** supervisory calls documented and available to the machine language programmer. Superzap utility included.

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COMPLETE utilities for file transfer and BASIC program conversion. Model III diskettes may be read directly. Model I and II via RS-232. Transfer BASIC programs, data files, or machine language files. NO support is provided for conversion of machine language files or PEEK's, POKE's, or USR's to function on PC-8001. Includes Mod I, Mod II and RACET NECDOS Datadisk with complete documentation on conversion requirements and syntax differences.

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SUPER FAST Machine Language In-Memory Sorts. Three-key sort on 500 elements in 4 Seconds!!! Simple one-line BASIC functions — SORTV and SORTC verbs. Mixed ascending and descending keys.

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Machine language BASIC ISAM utility provides keyed and sequential access to multiple files. Simple interface to BASIC. Binary tree keyed-file index system provides rapid access to records.

RACET COMPUTES software for the NEC is distributed by the Waybern Corporation and is available from your local NEC Dealer.

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CIRCLE 53

"While firing phasers at enemy ships, players could establish and dissolve complex coalitions of forces over long distances."

BODY-SENSE GAME CONTROLS USED IN FITNESS ARCADES

Not since the introduction of the isometric tension sensor, which led to the development of the first Fitness Arcade, has a technological advance in game controllers had such a revolutionary effect on the practice of holistic gaming. The body-sense controller completely frees the player from needing to be in direct physical contact with the machine.

In one of the most popular of the body-sense games, Asteroid-Fencing, the player doesn't even have to resort to voice control. Instead, the movements of the video fencer's hands and feet are each separately propelled by lasers controlled by the movements of the player's hands and feet. Screens on each wall accurately depict front, rear and side views of the fencer as he battles the various swarms of holographically projected asteroids.

Work is already underway on developing the first Dance Arcade with discrete sensors for up to 100 different participants.

1. MUSIC MOLDING
2. DRAGONWARS
3. CREATION

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(1 2 3)

LOGOFF
SEE YOU IN THE FUTURE
??????EDUNET??????

Editor's note: With the interaction of video and computers becoming more sophisticated during the next decade, video games will probably never be the same, as this article predicts. Personal computers will increasingly bring a more "real" fantasy world onto the screens of computer games. Personal Computing *Magazine will continue to follow this subject through the 1980s.*

STOP PLAYING GAMES WITH YOUR RESOURCES !

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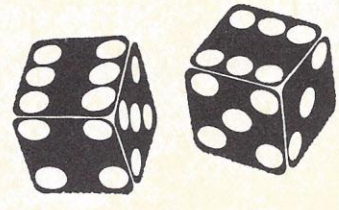
You can't, if you use software that simply automates the way people do things by hand, . . . but, with The ACCOUNTANT, by Decision Support Software, the power of your computer is harnessed to offer you the advantages of an automated double entry system even if you don't know a debit from a credit !

'BEST PACKAGE EVALUATED'

"For the home user (and perhaps in some less complex small business), the best package we evaluated was the Accountant by Decision Support Software."
— Mind Your Business Dept., Softalk, Jan. 82

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- Reference to accounts and codes by name or number
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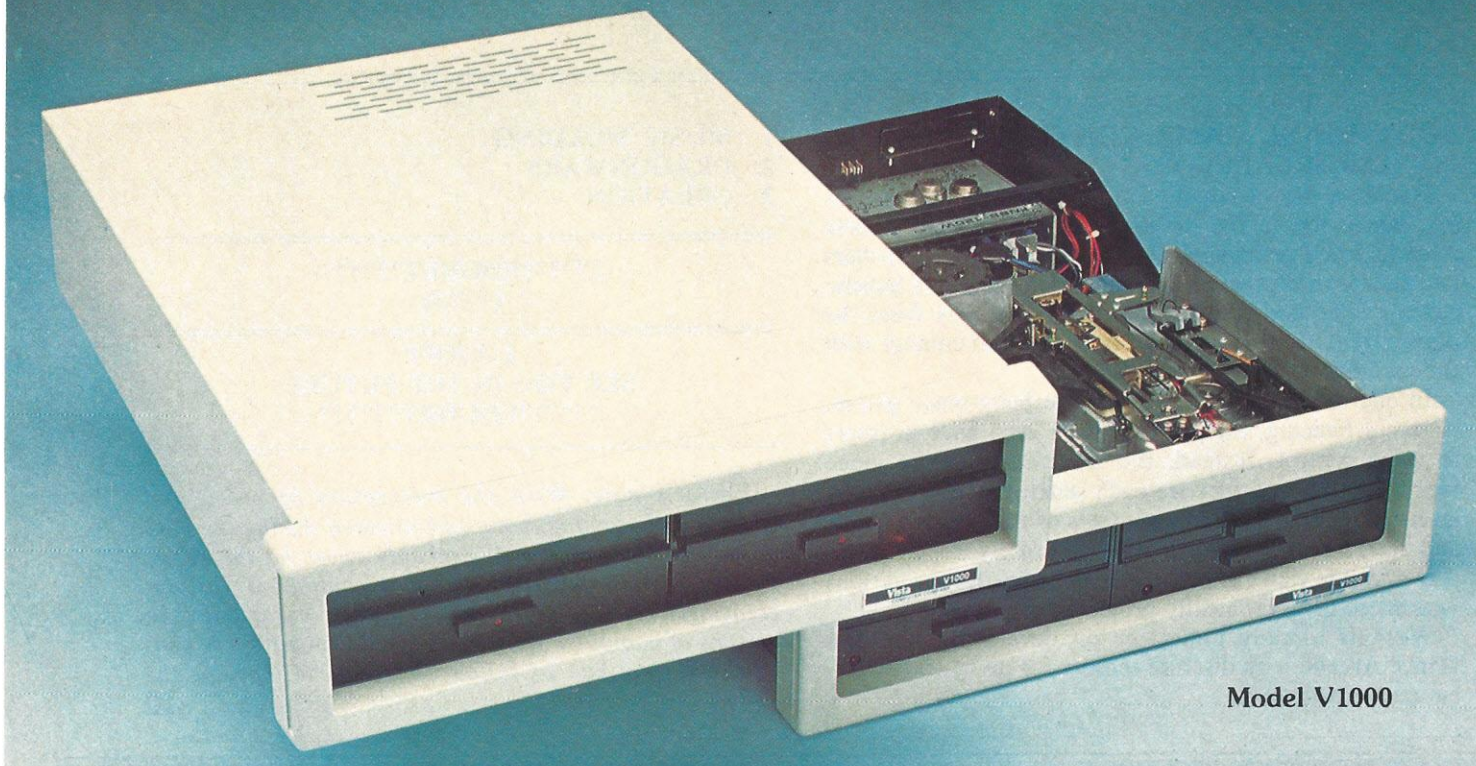
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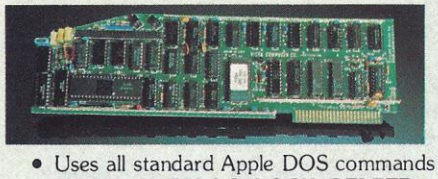
- Deluxe chassis with internal slide allows easy access
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- Accommodates both single-sided and double-sided drives
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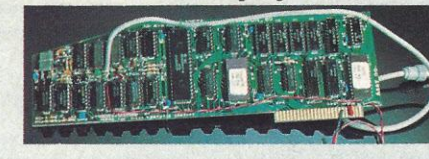
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A/D CONVERSION

(continued from page 64)

or make your business life easier.

However, once the converter is in place, the job of applying analog-to-digital conversion takes over.

Imitating human speech

An example: Some of the most sophisticated work being done with A/D conversion—and probably a prime avenue that this electronic system will travel over the next few years—is in speech synthesis and recognition.

One of the biggest problems in synthesizing purely electronic speech on a computer—that is, creating a reasonable facsimile of human speech sounds—is the large amount of memory required. The larger the vocabulary of the computer, the more memory necessary. The standard method—and the easiest way—of synthesizing human speech is to store the speaker's voice on the memory chips of the personal computer and then, upon demand, replay it. The spoken words are analog information, so this data must be converted into digital form for the computer's purposes. This is known as digitized speech, and it requires from 10k to 20 kbytes of memory per second of speaking.

Obviously, because most personal computers—until recently—carried only 16 kbytes of total memory, new techniques had to be found to create speech on a personal computer.

Several companies are currently working on this problem. One of the methods that appears the most promising produces most of the phonetic sounds of the human voice synthetically, while requiring only 500 to 900 bytes per second of speech—an amount that easily fits into the memory limits of the personal computer. But one word of warning: Because speech synthesis is extremely difficult, the boards are very complex and expensive—in fact, you run the chance of doubling your computer investment just trying to teach the machine to talk.

Human imagination being what it is, at the same time that researchers were finding ways to make the personal computer talk–as primitive as they may be—others started figuring out how to make it a good listener. The first speech-recognition board for personal computers is SpeechLab, a product of Heuristics, Inc., a speech- research company.

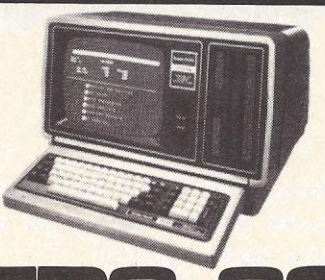
Word identification

The first step in speech recognition is to teach the computer to identify individual words. This is done by typing the word on the keyboard and then pronouncing that same word into a microphone attached to the SpeechLab. SpeechLab's circuitry quickly analyzes the spoken word, converts it into a digital code, and stores it using very little memory.

There are many possibilities for this device, especially for the infirm or handicapped who cannot manually manipulate the computer. Also, a computer equipped with SpeechLab could be used to control heating or lighting, use a telephone, or operate the television. Moreover, it is being considered as a way to store the various commands of a computer language and to allow a programmer to create software verbally. And as long as we're theorizing, it might be the ideal way to control that robot you've been thinking of owning.

Much more is expected from A/D conversion in the near future than what is currently available for personal computers. The limitations are apparently only in the creativity of the people who write the software. Although in this article we have described the hardware that can be used for controlling one's home, and for voice synthesizing and recognizing, it is the programming, or software, that follows the installation of these boards that is crucial to their successful use.

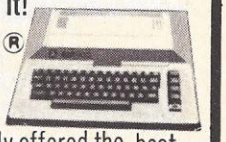
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CIRCLE 56

EMPLOYEE TRAINING

(continued from page 80)

ready, and not vice-versa.

In the long run, computerized instruction can boost your training efforts. Many of the rudimentary training tasks that fall on management's shoulders or tie up other employees can be relegated to the computer. If you have a limited training staff, the computer can be used to spread coverage. Instead of repeated face-to-face sessions, the trainer can direct a cadre of computer "assistants." The need for this approach would be even greater if you have no trainers in your company.

Limitations, too

While computerized training has numerous advantages, it also has limitations. Ed Yeager, president of Yeager Associates in Novi, Mich., cautions about the misuse of this approach. As the head of a consulting firm that specializes in developing computer-based training programs for industry and government, Yeager sees a danger in treating the method as an end in itself rather than as a means to an end. "Don't become enamoured with "gimmickry" at the expense of real results," he stresses. The learning theory should underlie any training program, he says, and measurement of achievement should be based on meeting job-related objectives, not merely completion of a training program.

Stan Goldberg underscores this point and adds, "People who must learn to use a computer at work may often become victims of somebody else's creative zeal."

Another point Yeager makes is that training content can inappropriately be forced into the computer mode, and can actually hamper learning. He contends that there are situations in which learning needs to take place on the job, from a good model or in a peer group.

In addition to these problems that companies may experience, computer-based training can often bring out fears that both trainees and trainers have when confronted by the machines for the first time. Yeager says that many people assume they must first know something about the computer to learn on it, and if they don't, they're immediately afraid of it. Trainers may also become fearful because they think they're losing influence in the training program. As Yeager states, "Instructors are instructors because they love to stand up in front of a group and instruct, and they see the computer taking that away from them."

But this need not be so. The instructor still plays an important role; the computer simply makes the instruction easier.

An additional drawback to computerized training is the cost factor. Some of the options available today are more viable for larger companies than for small ones. Because of their ability to pay the price and ammortize expenses over a greater number of people, big organizations have more opportunity to take advantage of this new technology. Fortunately, alternatives exist for small, cost-conscious companies.

Still, even small companies must be careful not to make purchase decisions based on cost factors alone. The object is to meet your needs and set the best value. Support, added services and leading edge innovations cost, but may be your best bets. On the other hand, expensive is not always best.

Micro Lab's Goldberg adequately sums up the cost and time concerns of employee training when he says, "You just can't afford to take the time to teach people, but you have to teach them, or how will the company function? But it's so expensive that we have to go to more efficient ways. I'm not saying that computerized training is the most efficient way, or the best way, or the only way, but it's a step forward and it's a direction that industry must take."

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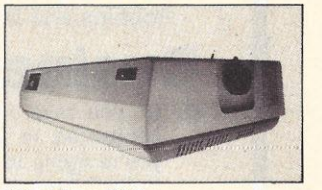
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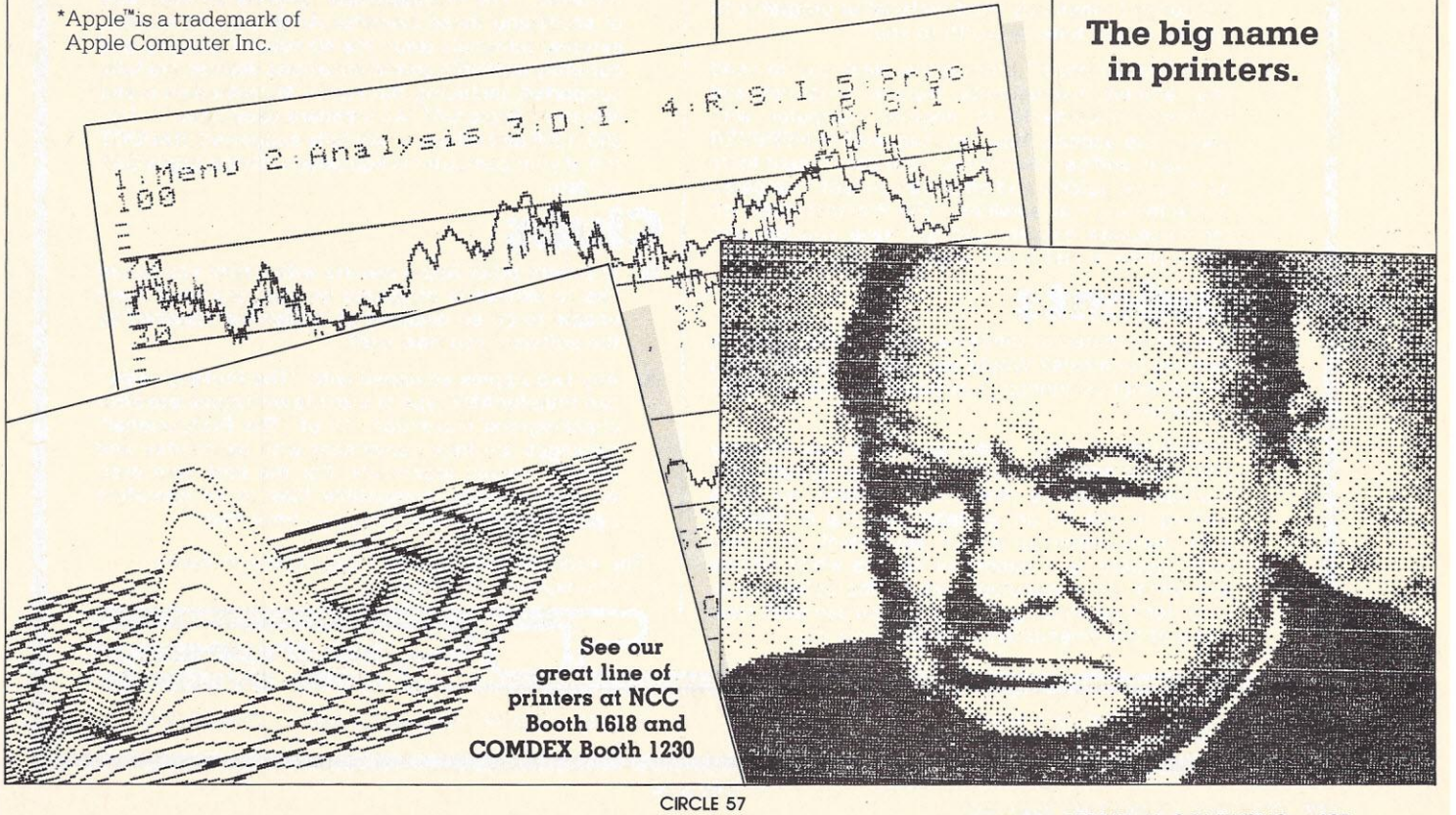


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Businessmen

Q. Do you have difficulty operating your printer when connected to a time-sharing computer? Are files you're trying to download too large for your system buffer? Does your host computer lose data when you send files to it?

A. "The Professionals" incorporate printer ring buffers which allow slower printers to accept data at their own rates. Very large files are easily received by periodically saving the buffer to disk. Unlike some software which can lose data during disk saves, "The Professionals" not only direct the host to stop, but actually wait for it to respond before performing the save. After a successful save, the host is automatically directed to continue. This process may be repeated indefinitely. Lost data during send is virtually eliminated by the widest variety of send options available in any communications software. "The Professionals" ensure fast, reliable data transfer of any valuable business information.

Authors

Q. Does your line of work involve sending written material to others? Are you a program author who would like to send work in progress to a partner or client and know that it arrived intact? What would the ability to instantly send material or programs to anyone at any time be worth to you?

A. "The Professionals" provide the ideal way to send your articles, manuscripts, reports, programs and technical documents to another computer with phone line access. Now you can work WHEREVER you want, and be assured that your data is sent to its destination quickly and error-free. In fact, compared to the fastest mail services, "The Professionals" offer immediate delivery and will save you the purchase price in just a few uses.

Students

Q. Are you bothered by limited access to your school's existing terminals? Would you like to be able to do your school assignments at home at your own convenience?

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Time Share Users

Q. Are you tired of wasting time and money sending or receiving files with inadequate, poorly designed software? Do you find yourself manually performing the same lengthy log-in procedures over and over again? Would you like to automate these procedures for yourself and others?

A. "The Professionals" allow you to send files which have been prepared in advance. They may then be transferred at any time, as quickly as possible — even to several different systems. No time is wasted reviewing information while on line; data may be captured by your computer or printer (or both) to be evaluated later at your convenience. These features assure minimum on-line time and therefore minimum on-line cost.

"The Professionals" introduce macros that are more sophisticated than anything previously seen in communications software. These "hand-shaking" macros allow you to perform complete multi-stage log-on sequences automatically; all you do is specify the system to be called. This eliminates sign-on errors and greatly simplifies operation of the entire system, not only for you, but for other less skilled operators.

Bulletin Boards

Q. Would you like to be able to take advantage of the information featured on local bulletin boards and information services such as The Source, CompuServe, Dow Jones, and others?

A. "The Professionals" open the world of modem communication networks to you. There are already thousands of these systems and networks in use nationwide. "The Professionals" provide an ideal way of accessing these systems. All 80 column boards, external terminals (even the 40 column screen), and currently available communications devices are fully supported, including the Hayes Micromodem II and Novation Apple CAT. All standard baud rates — 110, 300, 1200 and others — are fully supported; BAUDOT too, if your computer is equipped with the Apple CAT modem.

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Q. Are there other Apple owners with whom you would like to exchange programs or files, but have been unable to do so because of limitations imposed by the software you now use?

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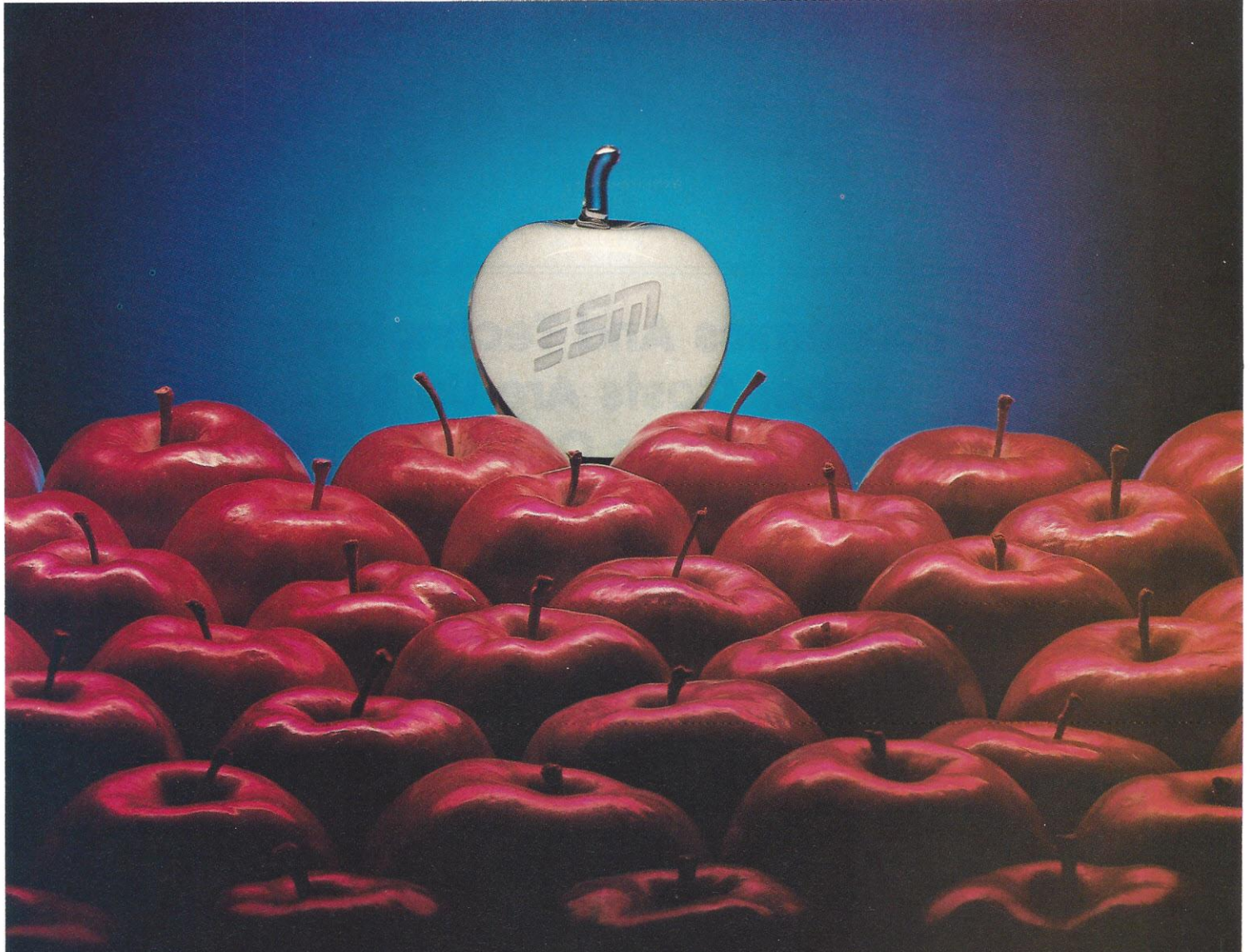
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CIRCLE 58



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SSM

The Transformation People

CIRCLE 30

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Economics And Technology: Labor Costs Are Up But Communications Costs Are Down

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248 pp., $11.95

Android Design won't show you how to build your own R2D2, but it will provide readers with a solid foundation with which to answer the many complex questions that must be answered before designing or actually building an android. Martin Weinstein's book shows readers what's involved in android design with examples, but without answers. As the author says, "We're not giving you answers so much as we're showing you where to look for them and how to find them."

A few short years ago a book on androids would have been called science fiction, but *Android Design* is anything but fiction. It is full of facts and ideas that readers must seriously consider if they are going to design androids, or beasties as the author prefers to call them. *Android Design* will interest computer users because it focuses on the problem/solution approach to developing guidelines and rules common to both androids and computers.

In describing the characteristics of an android, the author says that the machine's vital element is its programmability. That is, the "control of the set of available manipulative options which can be updated at any time." Therefore, a robot is a mechanism under the "constant control of a human or a computer, or other external intelligence." An android, though, is "capable of manipulating objects external to itself under the constant control of its own resident intelligence, operating within guidelines initially established and occasionally updated through reprogramming by a human, a computer or other external intelligence."

For example, Weinstein discusses the seemingly simple task of getting a beastie to climb a flight of steps. He shows readers how to evaluate the many variables involved such as gravity, weight, motion and wheel size before deciding on an elaborate triangular wheel drive. He also uses this problem/solution approach with the android's chassis, main motor drive, battery, collision avoidance system, vision, voice box, and, of course, its brains. While explaining the benefits an android can offer with some sort of verbal literacy, the author notes there is one word which a beastie should be able to understand regardless of the speaker—that word is no. "Pet owners fully understand the significance of this decision," Weinstein writes.

Android Design is a readable and often witty guide to getting started in designing an android. Although it covers all aspects of the design and construction of such a machine, it does not contain any blueprints or other specific recommendations on actually building one. Weinstein wisely leaves that to the reader's own imagination and determination.

In the book, Weinstein also compares the joys of having a pet android to that of, say, a cat or a dog: "An android pet could fetch the paper and your slippers, warn of newcomers, or smoke, or fire, perform a limited repertoire of chores and errands, and charm the bejabbers out of your guests. But it can't love. On the other hand, it won't have to be housebroken or walked or fed, merely refueled or recharged."

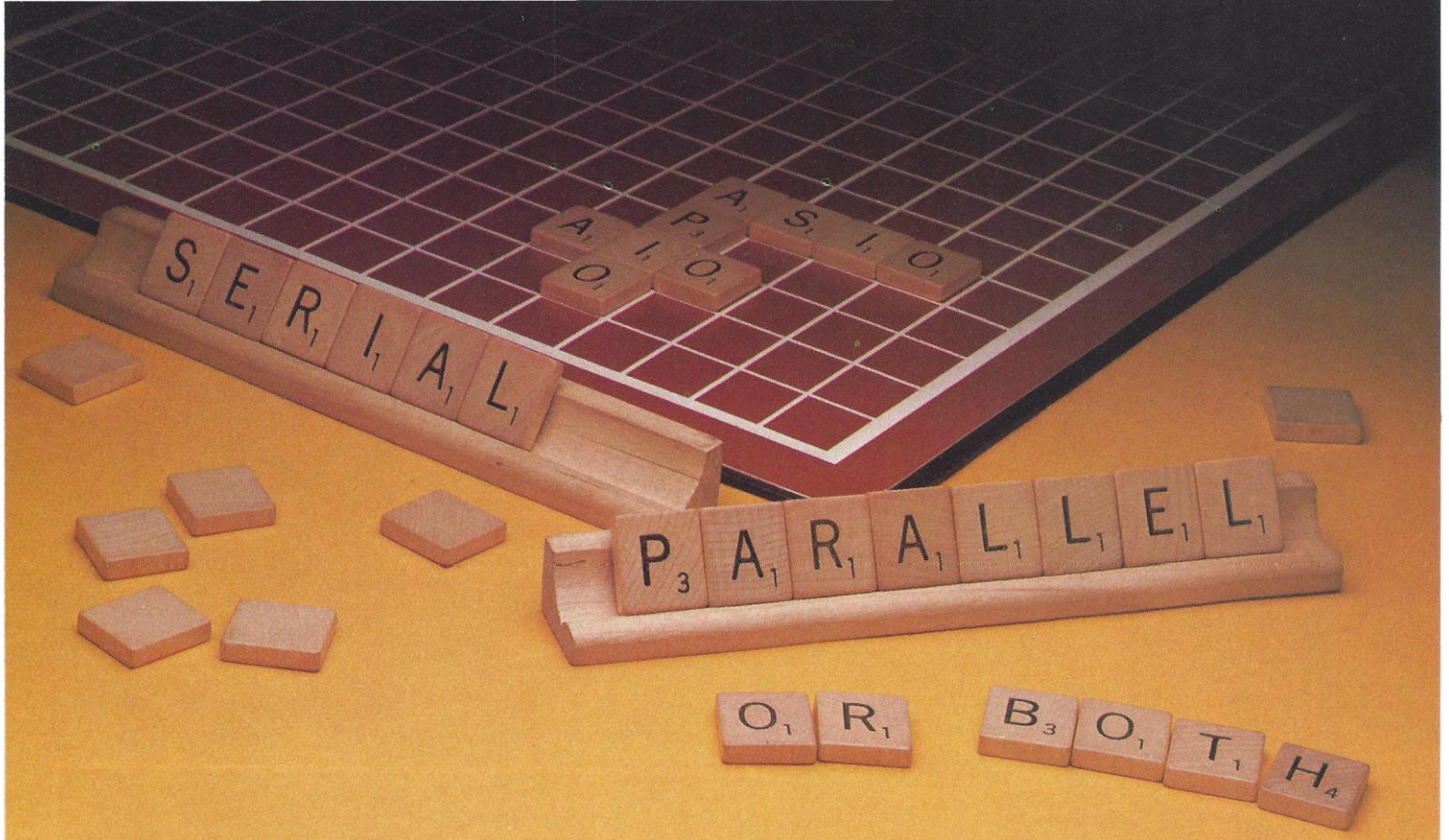
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SMALL BUSINESS COMPUTERS: A GUIDE TO EVALUATION AND SELECTION
KOICHIRO R. ISSHIKI
PRENTICE HALL
477 pp., $26.95

COMPU-GUIDE: THE CONSUMER'S GUIDE TO SMALL BUSINESS COMPUTERS
MARTHA EISCHEN
DILITHIUM PRESS
157 pp., $14.95

Both *Compu-Guide* and *Small Business Computers* focus on the broad range of management considerations involved in choosing the right small-business computer for a reader's specific needs. When read together, these two books will provide a thorough understanding of almost everything needed to make intelligent choices when purchasing computers for the first time.

Koichiro Isshiki, a professor at California State Polytechnic University in Pomona, has written a book filled with many practical and timely recommendations for users of small-business or personal computers. But the book does have one major drawback—it is much too long and



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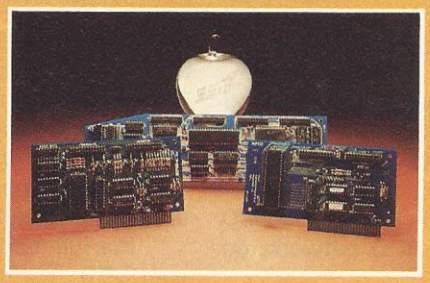
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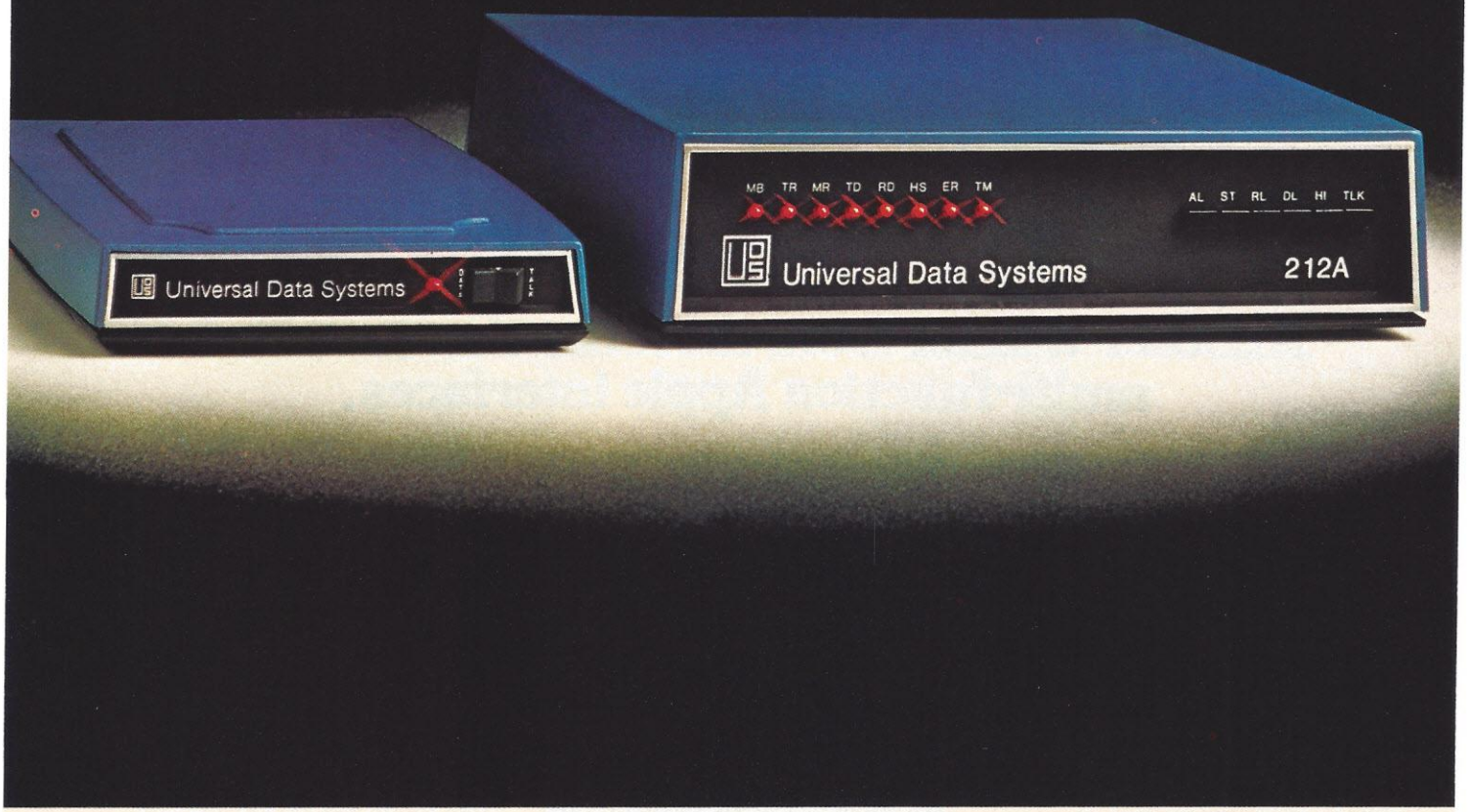
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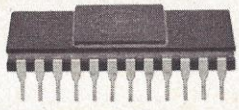
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too detailed. Like most textbooks, *Small Business Computers* is a bit boring and has about as much literary style as the Manhattan telephone directory.

On the other hand, *Small Business Computers* offers a special feature which more than makes up for its long-winded paragraphs. Isshiki has included dozens of comprehensive checklists and important questions that must be asked and fully answered throughout every step of the decision and selection process. While this book was written specifically for the first-time computer purchaser, experienced users will find it a valuable reference book that will provide them with vital questions that they might otherwise overlook.

In *Compu-Guide*, Martha Eischen says an overworked staff may be an important indication that a business should seriously consider installing a small computer. Likewise, Isshiki notes that if a company is considering one or two more specialized personnel such as accounting clerks, generally the cost of one such person would support a small computer system. He adds that a good rule of thumb is computer costs should not be more than two percent of a firm's gross sales, but in some special cases this may increase to a maximum of four percent of sales.

Although *Compu-Guide* is the less technical of the two books, it does offer a concise overview of the major points and problems involved in successfully choosing a computer system. One of Eischen's major recommendations is that a consultant be brought in to help managers determine the proper system. Consultants, she says, may find things that have been overlooked, while staff members are usually more cooperative to an outsider than to members of their own team who seek information. She also stresses that consultants must be thoroughly checked out and chosen not only for their technical ability, but also for their communications skills, personality and, above all, integrity.

Eischen further suggests questioning sales representatives of all hardware and software vendors. She points out that sales representatives often do not have any formal training that's related to computer science—sales representatives go to their company's training schools to learn how to get orders, not how to solve customer's specific problems.

Isshiki takes a similar standpoint and says that it is very dangerous and expensive to choose a first computer system without a formal, detailed study. He writes: "An additional cost of about $2000 to $10,000 is typical compared to the subjective judgment or vendor proposal technique. This means an additional one-time investment of about 10 percent of the system cost to yield profitability increases of 20 to 100 percent, and to help eliminate the risk of choosing the wrong computer. Choosing the wrong computer in relation to the actual needs involved may result in losing your entire business."

The men behind the machine

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VAN NOSTRAND REINHOLD
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4	DAYYEAR	Day of year a particular date falls on
5	LEASEINT	Interest rate on lease
6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
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CIRCLE 124

Making of the Micro full of life, persistence and genius.

Evans, a British psychologist and computer scientist, has written a thoroughly captivating and entertaining history of the microprocessor. To Evans, history is a giant jig-saw puzzle, and the pieces constantly move and change shape as new technologies are developed. He begins with a discussion of the simple but functional abacus, of which he writes: "It is a primitive device which has had a long run for its money—it has been around for about 5000 years."

When proving his point about the adaptability of the abacus, the author recalls the story of the great shoot-out in Tokyo shortly after World War II. The battle involved a Japanese clerk named Matsuzake, who used only his trusty abacus, and Private First Class Tom Wood of the U.S. Army, who used what was, at the time, the very latest in electro-mechanical desk calculators. "Matsuzake whipped Wood in overall performance to the audiences great delight," Evans writes, "for everyone likes to see machines with intellectual pretensions being made to look foolish." But Evans admits that the abacus couldn't beat even today's cheapest pocket calculator.

Evans then continues his historical journey of computers with Blaise Pascal (1623-62), a "vigorous intellectual capable of turning his mind to more or less anything that intrigued him. He was miles ahead of most of his contemporaries in terms of vision and imagination." The book further explains that the calculating machine Pascal invented to help his father's business was a commercial failure because: "The clerks and accountants employed by the potential customers of the machines were unashamedly afraid that if many of the things were purchased, they would be out of a job."

The book's excellent chapter on Charles Babbage (1792-1871) tells of his famous "analytical engine," a

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WORDPROPACK - Intelligent interface for WordPro 3, 3+, 4, 4+, creates lists of information from JINSAM files. It allows up to 10 conditions based on each item of information. Produce individualized letters, report cards, special reports, checks, invoices, etc.

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INTERAC - Interface which can read VisiCalc files, WordPro files and almost any sequential files to build JINSAM databases automatically. For example: You could "download" information on holerith cards to sequential files and INTERAC would place them into JINSAM files.

All accessories are accessed thru the JINSAM menu and require security password to gain entrance.

JINSAM gives you FREEDOM OF CHOICE. Start with JINSAM 1.0 and upgrade hardware and data at any time. Choose from accessories at any time. The JINSAM Newsletter brings the latest updates, user input and uses and keeps an eye on the future.

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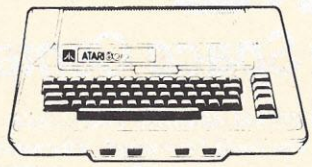
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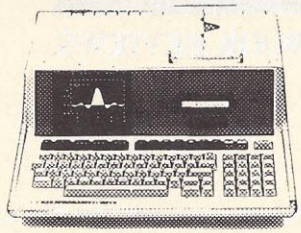
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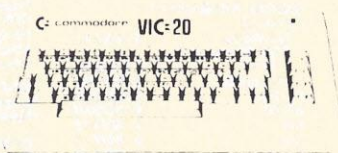


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CIRCLE 71

truly programmable and recognizable computer. "It would have been steam driven and programmed by means of machine cards, but was never completed. Had Babbage the benefit of electricity, the development of the computer might have been a very different story," writes Evans.

The Making of the Micro also emphasizes that while the Babbage designs worked on paper, the hardware—that is, the technology of the early 19th century—could not yet manufacture the nuts, bolts, cogs, cams and gears to the fine tolerances needed to build the analytical engine. Thus, Evans says that Babbage "died a disappointed man, but he had grasped a concept so exciting and so revolutionary that it would someday change the world!"

In writing of the first modern computers, Evans provides details about the building of the top secret "Colossus" computer, which England used during World War II to crack the German codes. The author says the first machine was installed and operating by 1943, and it was fed information on paper tape. Of the contribution Colossus made to the war effort, Evans writes: "Many people think Colossus won the war for the Allies. The Germans, confident that their Enigma machine would produce uncrackable codes, used it in blissful complacency throughout the war, believing their telecommunications messages to be inviolate."

With such a cast of characters, *The Making of the Micro* is a fascinating and endlessly colorful history book, and should be mandatory reading by everyone who uses computers. Readers will realize that not only was the late Dr. Christopher Evans a superb historian, but he also had a touch of the poet in him. He says: "If you really want to contact the ghost of Charles Babbage, build your own personal computer on your kitchen table. If you do this and you have the

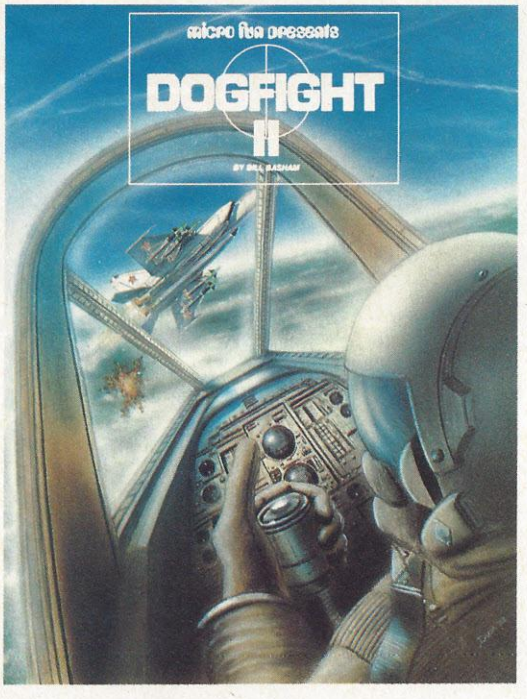
(continued on page 145)

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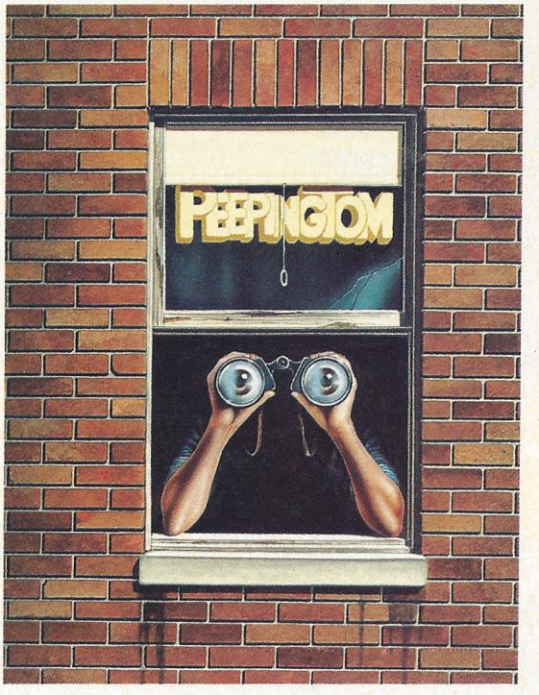
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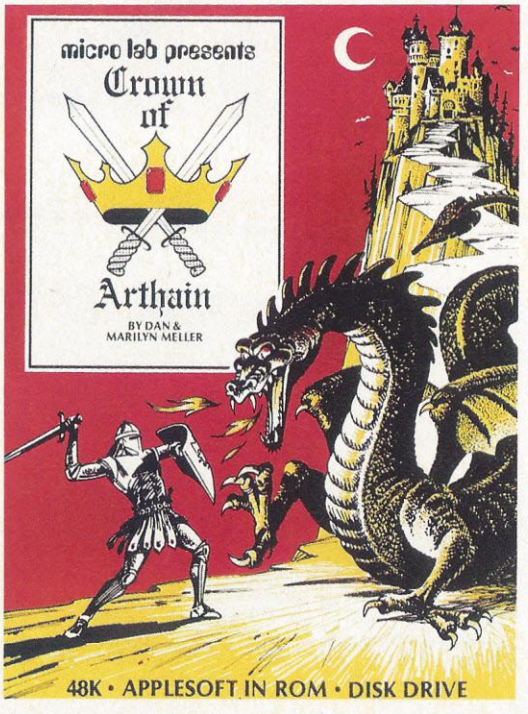
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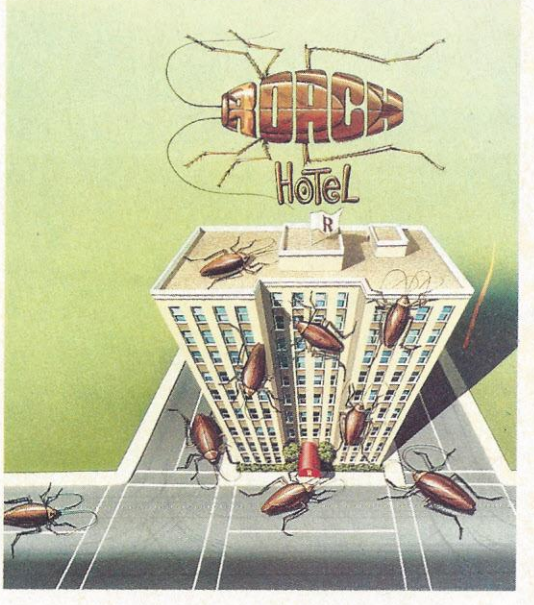
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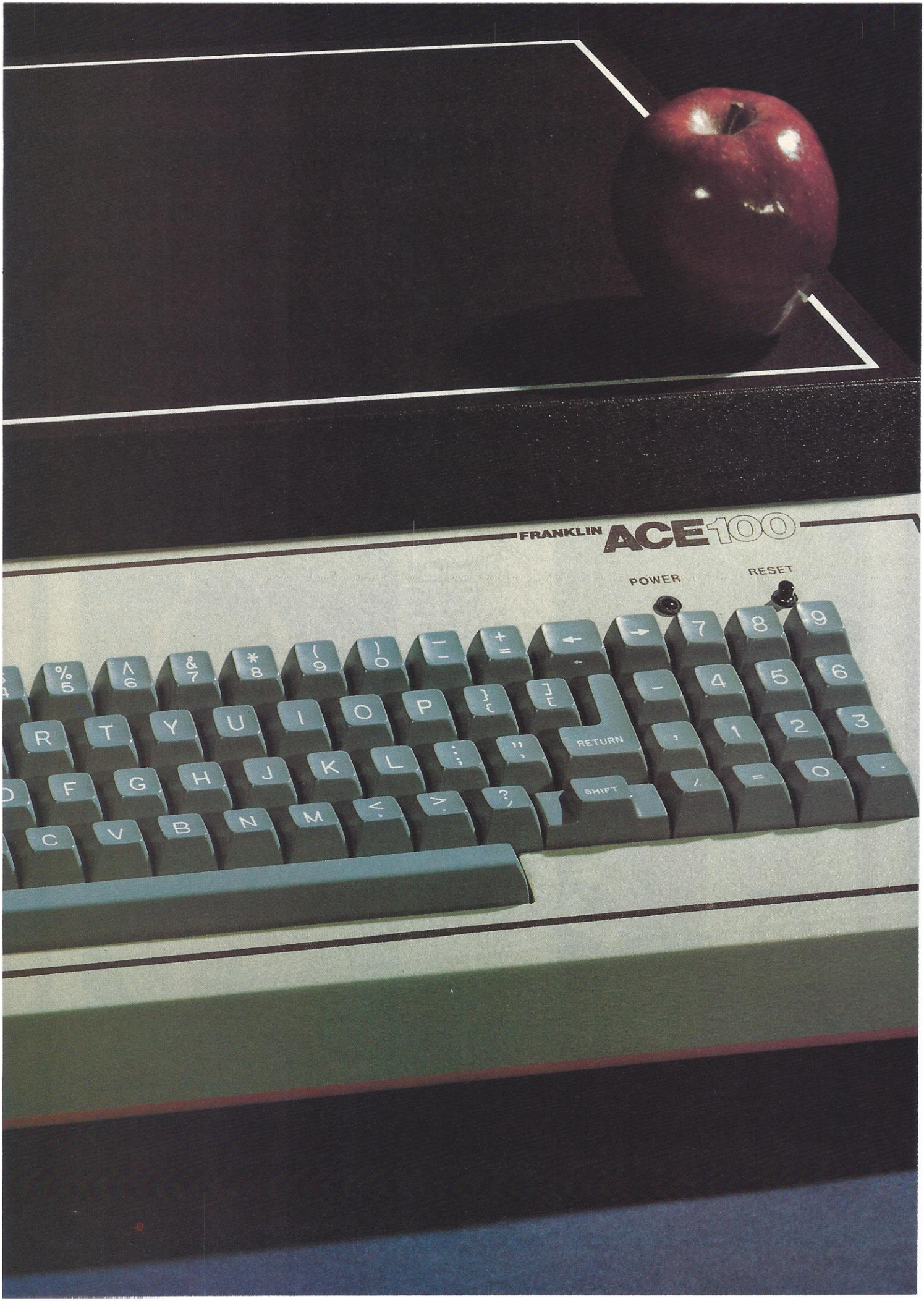
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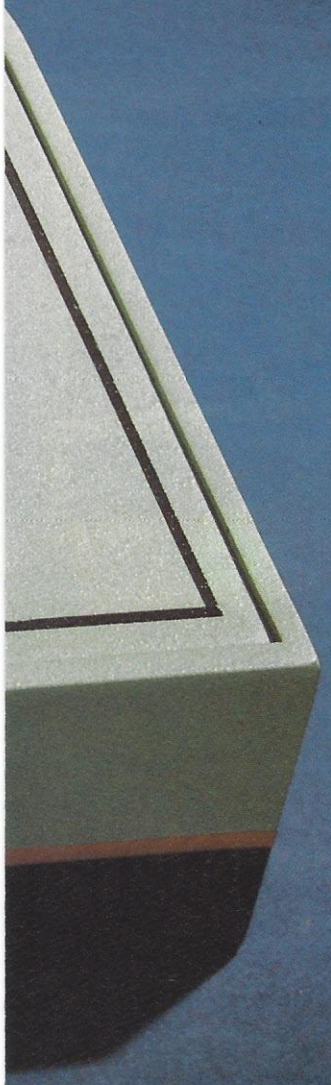
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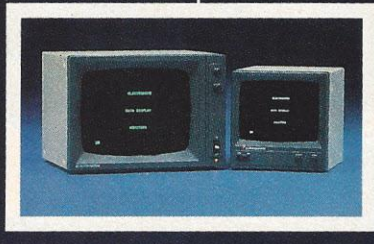
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(continued from page 140)
right kind of way of looking at things, you may find Babbage at your elbow."

The takeover of office typing

WORD PROCESSORS AND INFORMATION PROCESSING

DAN POYNTER
PARA PUBLISHING
170 pp. $11.95

If you are still undecided about installing a word processor in the office, consider Dan Poynter's basic facts about economics and computer technology: 1) Labor costs have been rising at greater than six percent a year; 2) Communications costs have been falling at a rate of eleven percent annually; 3) The cost of computing has been dropping at a rate of about 30 percent a year; and 4) With a conventional typewriter, a document is exposed to new errors each time it is retyped, which increases costs. Therefore, the author says, whenever a machine such as a word processor can be installed in place of a new employee, it makes good economic sense to do so immediately.

Poynter maintains that word processors will not totally replace conventional typewriters, but they can take over the vast majority of office typing. In *Word Processors and Information Processing,* the author quotes two leading word-processor manufacturers, Wang and Zenith, as saying word processing will increase typing productivity by 50 percent. The author adds that many secretaries, executives and technical writers feel their output has increased 300 to 400 percent by using word processors. This leaves them time to do other important office tasks.

Among the book's many practical

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recommendations is the suggestion to make a carbon copy of every sheet of paper that goes through the office typewriters in a given month. Armed with these documents you can more easily determine the exact word-processing requirements for the office. The book also suggests bringing some of these documents to hands-on demonstrations with several different types of word processors before you buy. The idea is to see if the information can be entered and processed quickly and easily by the office staff.

In addition, Poynter gives readers a timely warning: "Get a hands -on, do-it-yourself demo to get the feel of the machine. Sit at the machine and spend two to three hours. Run the same material on each brand. Put the machines and the sales representatives to the test. Make them work for the sale!"

Another factor that should be considered is the ergonomics or biotechnology between the staff and their word processors. After all, as the book explains, a word processor, unlike a photo-copy machine or a stapler, becomes "a lot more personal than any other piece of office equipment because it is used all day long." Therefore, it must be designed for user comfort and convenience. Terminals should be able to tilt and/or swivel to face the operator and avoid reflecting overhead lighting. Keyboards should likewise be able to move away from the CRT for maximum operator comfort and to help reduce fatigue. "Terminals must be designed to adapt to the operator's eyes and not vice-versa," Poynter writes.

The book also provides some timely advice on phasing in word processors or any other new system, while keeping your staff's morale high. The author says the word processor's introduction will be smoother if the people ultimately responsible for its successful operation are involved in the buying process. "It is always easier to make a change when the participants are fully aware of the change and how it will affect them."

Poynter best sums up the arguments for word processors over additional secretaries or typists when he writes: "At the end of the year, either you will have equity in a valuable machine or another employee on the payroll. At the end of two years you are $15,000 ahead with the word processor, and the machine never goes on vacation, takes a coffee break, or asks for a raise."

As a whole, *Word Processors and Information Processing* is an easy-to-understand, fact-filled guide to all areas of word-processing technology. The book explains exactly what the machines can and cannot do to increase office efficiency, and what factors to consider when choosing the best system for an office's specific needs.

They increase, not decrease, employment

EXPLORING THE WORLD OF THE PERSONAL COMPUTER
JACK NILLES
PRENTICE HALL
233 pp., $12.95

Jack Nilles, a Senior Research Associate at The Center for Futures Research, University of Southern California in Los Angeles, has written a thought provoking and intelligent analysis of both the philosophical and practical considerations of using personal computers. *Exploring the World of the Personal Computer* also examines the future of personal computers. The author states that the growth of personal computers will be similar to that of color telelvisions, with the number of households with computers "exceeding 95 percent by the end of the century."

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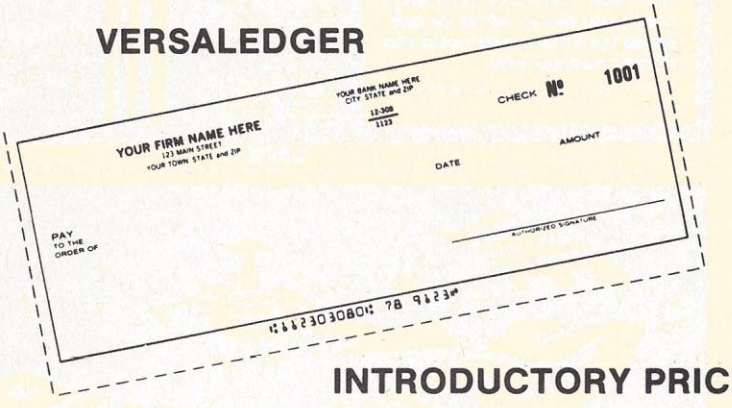
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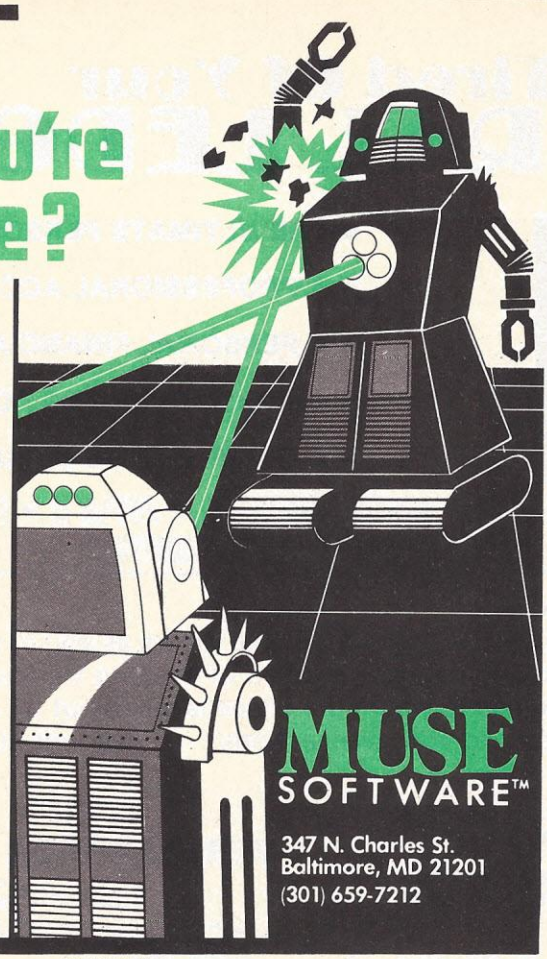
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BOOK REVIEWS

sonal Computer, Nilles also makes a persuasive case for the fact that computers have actually increased and not decreased overall employment. He says that during the past two decades, the size of the work force in general has increased 44 percent, while the work force in the information industry has grown from 39 percent to an estimated 54 percent. "Unemployment during this period has stayed relatively constant," he says. "Therefore, whatever is happening in the United States and abroad, the introduction of computers has not resulted in a significant reduction in total employment."

To further prove this point, the author cites examples of the computer industry's creating jobs in programming and manufacturing industries. Nilles says the number of programmers required to run large computers tends to either stay constant or to slightly increase with time.

This, of course, leads to, and proves the validity of, an important and practical law of computer use that is well worth remembering: "The availability of better information, via a personal or large computer, creates a demand for even more and still better information," Nilles writes.

Among the book's most interesting predictions on the many uses of personal computers concern those people involved in health and education. The author says personal computers will shortly be able to monitor and communicate information on heart patients, and also detect sudden-infant-death syndrome. Research on both of these conditions is currently being conducted by the National Institutes of Health and the Veterans Administration.

Exploring the World of the Personal Computer is a refreshing if not somewhat intellectual discussion of the ever changing scope of personal computers. It is an informative and challenging book that is well worth reading, and it is highly recommended.

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A Tutor For Computer Bridge

by Thomas Throop

For those novice computer bridge players interested in learning the basics of the game, Apple Computer markets Bridge Tutor with Precision Club and Scientific Bidding. The product, written by Alex Hause, consists of two disks.

The first disk contains instructional material on seven different topics, which include three bidding systems or approaches to bidding—the Standard American approach, the Precision Club approach, and the Scientific approach. Other topics involve some very elementary explanations for a beginner, such as the scoring, the play by the declarer, and any opening leads by the defense.

The second disk generates random hands so you can practice what you have learned from the first disk. The random hands are generated by a "Quizmaker" routine, which deals out a complete bridge deal of 52 cards into four hands. Quizmaker then takes each of the hands as four of the random hands so you can practice your bid in a given situation.

One problem with the Quizmaker's generation of random hands is that they are truly random. If you find a group of four interesting hands for which you do not come up with all of the right bids, and you then wish to return to the instructional material and regenerate the same hands for testing your knowledge, you cannot recreate the hands.

Let's look at a few hands with the suggested bids in each of the three systems or approaches. Figure 1 shows some hands for bidding in the Standard American system. This was the first set of four hands generated by the Quizmaker, along with the suggested responses to an opening bid of 1 club, 1 diamond, 1 heart, 1 spade and 1 no-trump.

a.)	S 9865	**b.)**	S AT
	H A7		H 0986
	D 72		D K43
	C AK643		C QJT7
c.)	S K732	**d.)**	S QJ4
	H JT4		H K532
	D QT95		D AJ86
	C 52		C 98

FIG. 1

The suggested responses to the hands in figure 1 are shown in figure 2. These suggested responses are fine except for the bid of 2 hearts in response to your partner's 1 spade with hand (b). This bid shows a five-card heart suit, which you do not have. With hand (d), which is similar, the program correctly does not wish you to bid your heart suit. Thus, the program is correct on (d) but incorrect on (b).

PARTNER'S BID	YOUR BID			
	(a)	(b)	(c)	(d)
1C	1S	1H	1S	1H
1D	1S	1H	1S	1H
1H	1S	3H	2H	3H
1S	3S	2H?	2S	2D
1N	2C	2C	Pass	2C

FIG. 2

Subsequently, 30 or so more hands were generated with the Quizmaker. This situation came up four times. The bid of 2 hearts in response to your partner's 1 spade on only 4 hearts was suggested incorrectly on three of these four hands.

Another situation that gave the Quizmaker trouble was when it responded to 1 no-trump with the hand shown below.

S Q4
H KQT8
D AKJ64
C T4

Your response to your partner's opening 1 no-trump bid should be 2 clubs, the Stayman Convention, asking your partner to show a four-card major. However, the program suggests that you immediately leap to 4 clubs, the Gerber Convention, to ask for your partner's aces, since a slam seems very likely. This idea is fine, but the 4-club bid should be made after you have checked with Stayman to see if your partner has a 4-card heart suit.

In a few hands within the Presision Club system, the

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CIRCLE 74

bids suggested by the computer program were quite reasonable. One set of four hands is shown in figure 3.

a.)	S	K632	**b.)**	S	QS
	H	-		H	KT9872
	D	64		D	AKT9
	C	JT98762		C	3
c.)	S	A752	**d.)**	S	J94
	H	QJ3		H	A654
	D	532		D	QJ87
	C	K54		C	AQ

FIG. 3

The suggested opening bids in this figure were pass, 1 heart, Pass, and 1 no-trump, respectively. In hand (b) you are not quite strong enough to open 1 club showing 17 or more points; 1 heart is correct. In hand (d) you have a no-trump-type hand in the range of 13–15 high-card points; 1 no-trump is the correct opening bid.

Now let's look at a few hands from random hands involving the Scientific bidding system, which is played by some of the top bridge players. One set of four hands the Quizmaker dealt is shown in figure 4.

a.)	S	T54	**b.)**	S	98
	H	765		H	KQ83
	D	J2		D	KT864
	C	AQJ65		C	93
c.)	S	QJ763	**d.)**	S	AK2
	H	J42		H	AT9
	D	AQ3		D	975
	C	72		C	KT84

FIG. 4

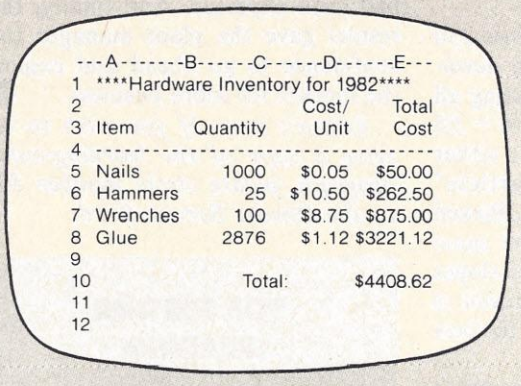
For each of these hands you are to respond to an opening 1 no-trump bid by your partner. The suggested responses to 1 no-trump are a) 2 clubs, b) 2 clubs, c) 2 hearts, and d) 4 clubs. In (a) you plan to rebid 2 no-trump over your partner's 2 spades, 2 hearts or 2 diamonds. In (b) you hope your partner has a four-card heart suit, which he will show over 2 clubs by bidding 2 hearts. In (c) your 2-heart bid is a transfer bid, requesting your partner to bid 2 spades so the strong hand will be the declarer. Over 2 spades you will invite game by bidding 3 spades. In (d) the 4-club bid is the Gerber ace-asking convention, as a slam seems very likely.

As a whole, this product allows you to learn the fundamentals of three different bidding systems. The concept of the Quizmaker is good, but the dealing procedure should use a pseudo random-number routine rather than a truly random routine. A more serious problem is that you cannot usually bid a hand to the game's final contract.

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ScratchPad

The problem with other spreadsheets is that you are only allowed relatively few entries. ScratchPad with virtual memory (an advanced memory management technique) allows essentially unlimited number of entries by letting your disk drive act as secondary memory when you run out of RAM.



```
   ---A-------B------C------D------E---
 1 ****Hardware Inventory for 1982****
 2                              Cost/      Total
 3 Item          Quantity       Unit       Cost
 4 ------------------------------------------
 5 Nails             1000      $0.05     $50.00
 6 Hammers             25     $10.50    $262.50
 7 Wrenches           100      $8.75    $875.00
 8 Glue              2876      $1.12   $3221.12
 9
10                   Total:               $4408.62
11
12
```

ScratchPad includes all the most useful features found in other popularly available spreadsheets, but has added these state-of-the-art innovations:

- Virtually unlimited number of entries.
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- Unlimited title locking.
- The "IF/THEN" function.

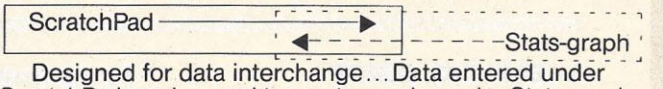
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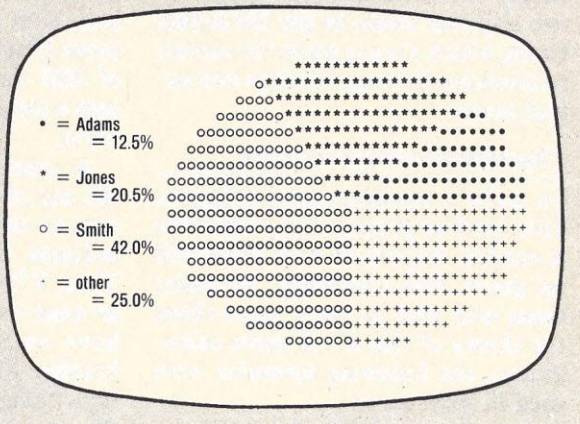


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CIRCLE 79

"It is estimating labor hours that is difficult since workers have no experience with a new product."

A LEARNING CURVE

(continued from page 96)

average-hours curve. After the thirtieth unit, the slopes of the two curves are very similar. Between the first and thirtieth units, the actual hour curve is constantly changing and no formula is given.

The computer program does not use the formula given above, since it is not always correct. The program simply subtracts the total hours for two adjacent totals to get the actual hours, which always gives the correct relationship between average and actual hours.

Theoretical considerations

To write a learning-curve program, little math or programming expertise is needed. Experts in both areas will no doubt find shortcuts. To assist those who wish to know more about the theory of this set of curve calculations, the following formulas were used in some form:

$\log_X = \log_K + N \log X$ where

Y_X = Average hours for X units
K = Hours for the "first article"
X = Number of units produced
N = Exponent representing the slope of the curve

By algebraic manipulation:

$K = \frac{Y}{X^N}$, and $Y = K(X^N)$, while $N = \frac{\log (K \div Y)}{\log X}$

Twice in the program, at lines 330 and 700, average hours were developed from actual hours by testing all curves with a slope of −.514 to −.05 until a curve was found that either gave a satisfactory "first-article" number of hours (Part 1) or allowed both data points to be on the same curve (Part 3). A step between slopes of .005 was allowed, so the result is only a close approximation of the best curve.

A special note is necessary about the use of one symbol. The TRS-80 uses an arrow pointed upward (↑) to indicate "raised to the power of." Thus, Y↑N means Y^N. But the printer used with this program does not have an arrow. It uses a square bracket like this [to indicate the same thing. Line 340 is an example of the use of the bracket.

The happy ending

The end results of the Cleveland vacuum-cleaner company's first production run of a small, specialized order were the cause for more than a little jubilation. There had been an 83 percent curve. Moreover, there was indication of greater net profit than had been expected. And finally, the results gave the plant manager the confidence to go ahead and exploit the market for more business.

Editor's note: If you wish to receive a copy of the learning-curve program, please circle number 336 on the Reader Service Card.

FOR FURTHER READING

- Niebel, Benjamin W., *Motion and Time Study* (Homewood, Ill: Richard D. Irwin, Inc., 1976).
- Huntsberger, David V., *Elements of Statistical Inference* (Boston, Mass: Allyn & Bacon, Inc., 1964).
- Kroeber, Donald W., and La Forge, R. Lawrence, *The Manager's Guide to Statistics and Quantitative Methods* (New York: McGraw-Hill Book Co., 1980).

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CIRCLE 80

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A>PIP B:=A:ACCNT1.DAT[V]
```

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YOUR CURRENT DISK IS DRIVE A. DRIVE TO COPY TO? B
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```

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CIRCLE 82

how the Data Princess became a Queen

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¶ *"Not at all—I'm only $295," he smiled. "Princess, add my powers to yours and you'll be a data queen."* ¶ *"I will," said Data Star lovingly. "ACCESS/80 Report Writer, you're the answer to my prayers."* ¶ *Moral:*

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CIRCLE 83

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(continued from page 26)

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PERSONAL COMPUTERS: THE NEW STABLE HANDS

They say you can lead a horse to water but you can't make him drink. Darrell Vienna, a California horse trainer, says that the same could be said of his colleagues when it comes to computing.

While Vienna, who is responsible for over 60 horses at three California race tracks, has two Apple IIs working for him to automate time-consuming jobs such as billing, pedigree listing and animal husbandry, other trainers are still demurring.

Vienna thinks there is a simple explanation for this. "The backstretch of a racetrack is a very conservative place," says Vienna. "You don't find many trainers with technical backgrounds. That's probably why there aren't any more computers out there, but there will be in time."

And if Vienna's educated view of racetrack economics is correct, clearly there will be. He says that keeping track of a large number of horses manually is a cumbersome task, and that few alternatives to using a personal computer are palatable.

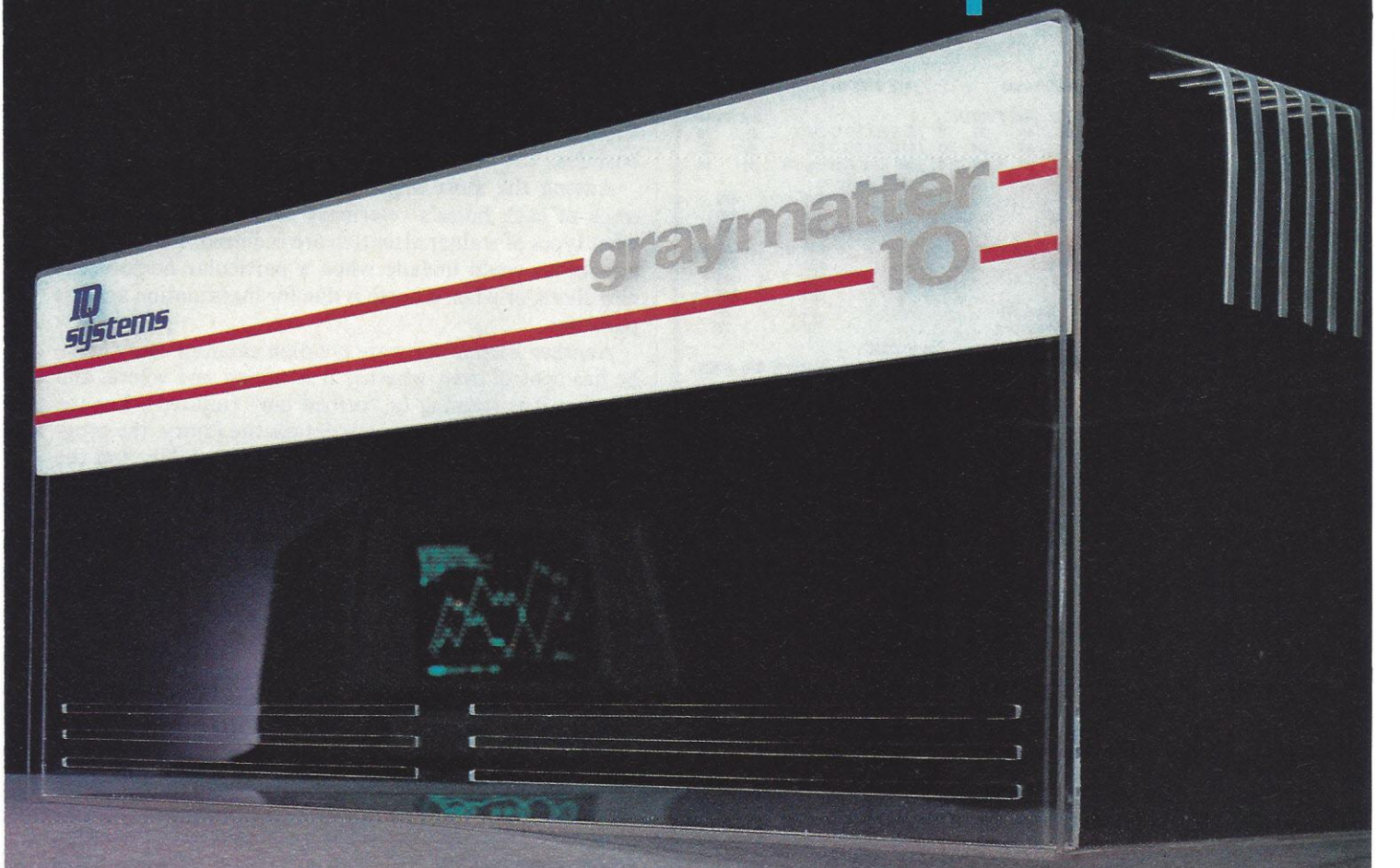
"It is possible to hire a service agency to take care of all the paperwork involved when racing your horses," Vienna says, "but for me the loss of control that entails is too great."

This type of thinking led Vienna to his association with computers, which began four years ago. Now his Apples fit squarely into the saddle of his growing business, which employs 35 and will be incorporated this year. Vienna works at the Santa Anita racetrack in Arcadia during the fall and spring, and moves on to Hollywood Park in Inglewood by early summer. Then it is on to the Delmar Circuit in Southern California.

After owning an Apple for only a few weeks, he began developing his own monthly customer-billing system. Working part time on this piece of software, in two months Vienna wrote a program that reduced an eight hour chore to one that took only an hour and a half.

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CIRCLE 85

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control by the computer, Vienna bought a second Apple II for use at the racetrack itself.

"We'd be done with our morning work by 10 a.m., but the races wouldn't start until 2 p.m.," he says. With this free time available, and with a computer at his fingertips, Vienna began to develop additional software for his business.

Among the most important is a program that keeps track of each horse's veterinary care schedule and lists what types of trainer attention are required. For instance, a printout could include when a particular horse needs new shoes, or when a horse is due for innoculation against parasites.

Another Vienna software creation catalogs every horse he has control over, whether it is racing and where, and whether it is training or "turned out" (injured). For the disabled horses, the program details the injury, the prognosis, when the horse is due back in the stable, and the arrangements needed to return the horse to active racing.

Both of these programs, Vienna says, serve as an electronic "filing cabinet." And while he has since seen several other Apple data-base management programs, he says he has yet to find one that works faster than his own system. Moreover, a main advantage Vienna has found in developing his own programs is that the software can be easily repaired if anything should go wrong.

"You can think through an error and know where to start to correct it, because you wrote the program yourself," Vienna says. "Machine language is Greek to me, but anyone with reasonable intelligence can get along with Applesoft BASIC."

A recent addition to Vienna's computerized operation was a set up involving an electronic communication nexus with Bloodstock Research, a firm in Lexington, Ky., that maintains pedigree information about every horse currently racing internationally. Through his Apple and a D.C. Hayes Micromodem, Vienna dials up Bloodstock and receives printouts detailing the ancestry of any one of his horses.

ATARI JUMPS ON THE WAGON

San Francisco's Save the Cable Cars campaign is $1,000,000 closer to its goal thanks to a gift from Atari, Inc. This brings the total generated to $7,000,000, according to Kenneth T. Derr, campaign chairman and president of Chevron, USA.

"Atari's generous donation has brought San Francisco considerably closer to the $10,000,000 it needs to keep the cable cars on track for future generations," Mayor Dianne Feinstein said in accepting the gift.

In colorful ceremonies at the cable car turnaround at California and Market Streets, Mayor Feinstein participated in an "electronic funds transfer" with Raymond

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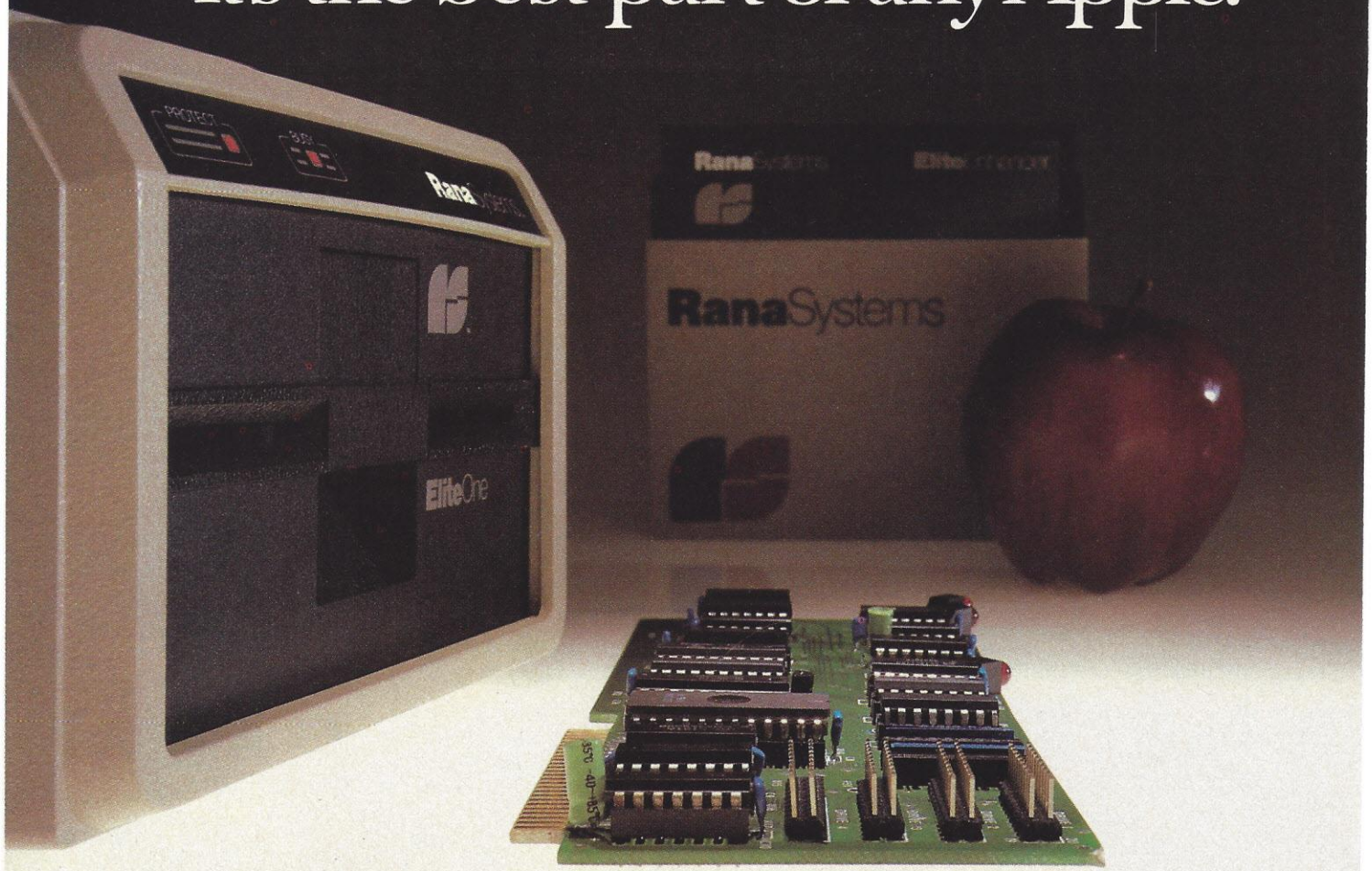
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CIRCLE 68

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RanaSystems



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CIRCLE 87

E. Kassar, chairman and chief executive officer of Atari. An Atari 800 Home Computer and a videotape, simulated the transfer of funds from Atari to the Save the Cable Cars committee. In return for the gift, the mayor unveiled a plaque on the side of Cable Car #59 showing that it had been adopted by Atari.

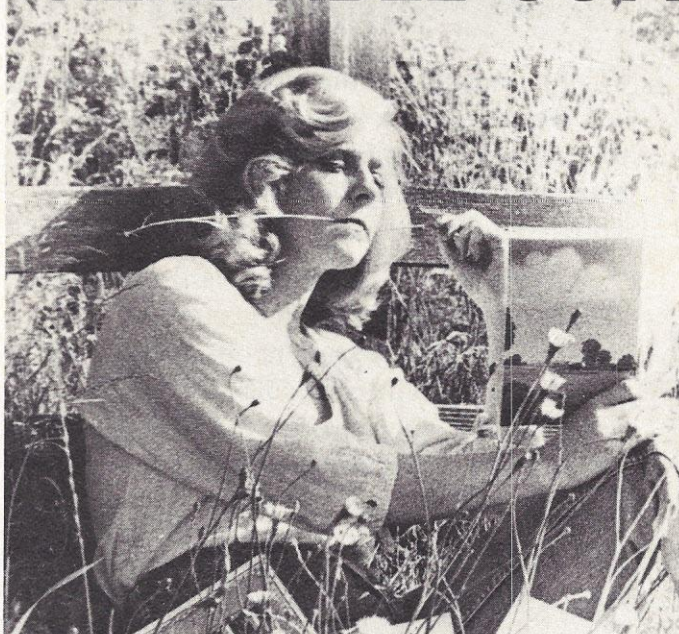


Atari's Raymond E. Kassar presents San Francisco Mayor Dianne Feinstein with $1,000,000 to save the city's cable cars.

Cable Car #59 hit the streets in March for the first time in 26 years. The earthquake and fire of 1906 destroyed the original, but a year later its reincarnation was back in service on California Street. It has been completely restored, mostly by hand, over the past two years.

In the past few years, it has become increasingly apparent that the City's famed cable car system would have to be completely overhauled or the cable cars would have to be put to pasture permanently. The federal Department of Transportation agreed to pay for approximately 80 percent of the $58,200,000 project, if San Francisco could come up with the remaining $10,000,000. A group of business and civic leaders then formed the Committee to Save the Cable Cars, to raise the money from the private sector. Today's total is the result of that effort and includes major donations like Atari's, along with thousands of gifts from businesses and individuals.

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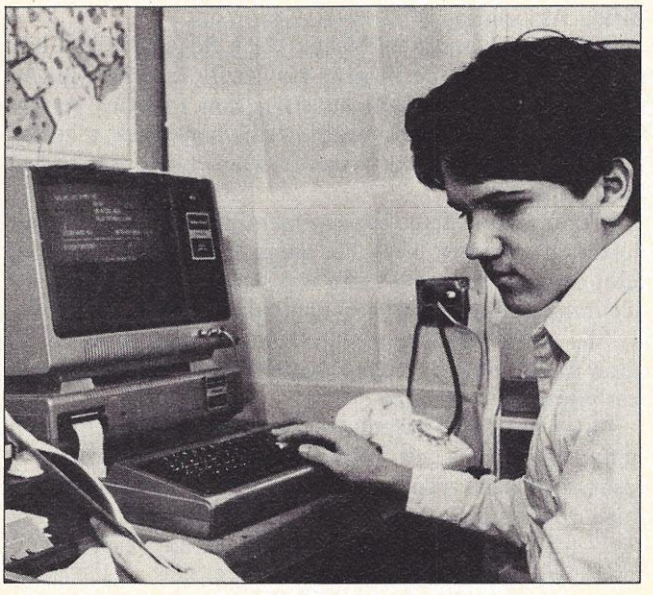
Engineering and design of the cable car project are currently underway, and the federal government has contributed $9,000,000 for this phase of the work. By September 1982, when construction is scheduled to start, San Francisco must have raised its full $10,000,000 share.

For more information about the cable car restoration project, contact the Committee to Save the Cable Cars at (415) 956-3777.

COMPUTER AIDS BROTHERLY LOVE

It's three o'clock in the morning and 15-year old David Nizen is using his Radio Shack TRS-80 Model I Microcomputer to aid the victims of spina bifida, a crippling disease that afflicts some 250,000 Americans, including his younger sister Jill.

Nizen works in the basement of his parents' home in Valley Cottage, N.Y., logging the names of potential donors to the Spina Bifida Association of America.

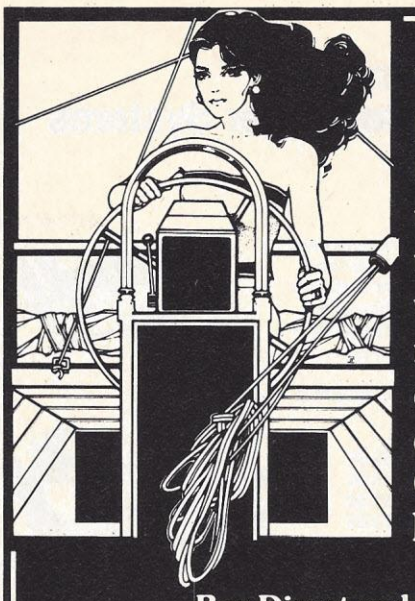


Many late nights of working at his computer are not a problem for David Nizen whose mission is one of family commitment.

When Nizen purchased the computer several years ago, it had 16k of memory and was, in his words, "incredibly slow to operate. With the cassette drive, it took five minutes just to enter and store a donor's name and address."

Eventually, he convinced the Spina Bifida Association to purchase two disk drives for his Model I (which increased the computer's memory capacity to 48k of RAM), a line printer and an expansion interface. He is now well on his way to converting the group's fund-raising efforts into a one-person operation.

The addition of the disk drive allows Nizen to group the



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	COLORSCAN 10 Color CRT	3,195	307	171	116
TELEVIDEO	925 CRT Terminal	850	82	46	31
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NEC SPINWRITER	Letter Quality, 7715 RO	2,895	278	154	104
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	2120 KSR Printer 120 CPS	2,195	211	117	80
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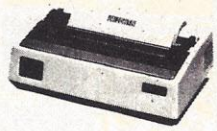
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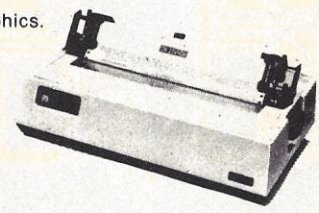
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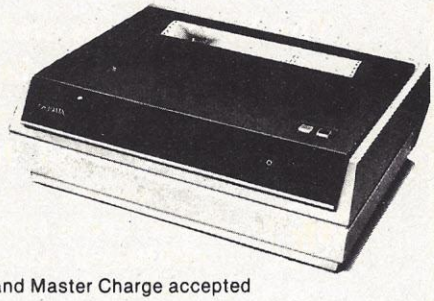




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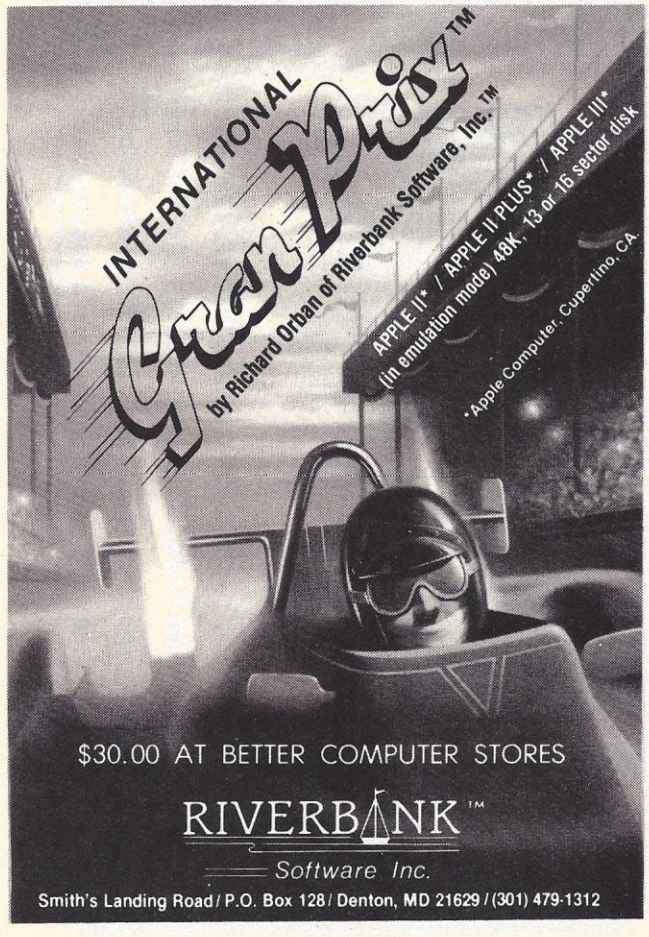
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CIRCLE 93



CIRCLE 94

OUTLOOK

names of potential donors by geographical location, amount of previous contributions to other charities, annual earnings and other information used by fund-raisers. His immediate goal is to log 250,000 names for the association's next national mailing campaign, due to begin this summer.

Nizen is currently considering upgrading his operation by purchasing a faster printer and switching to either a TRS-80 Model II or a similarly priced Addressograph computer. "The Addressograph I'm considering isn't nearly as versatile, but it is a lot more efficient and a lot faster," he says.

Without a personal computer, volunteers would have to spend weeks working with paper and pencil to accomplish what Nizen does in a single evening. Both the 12,000-member national association and the 600-member New York State Association are relying heavily on Nizen's work to pump new dollars into their nearly depleted treasuries, says Joseph Gallagher, president of the Spina Bifida Association of Greater New York.

Now a sophomore at Nyack High School, Nizen has spent most of his life helping his family care for Jill. At the age of six, he taught his sister how to swim. A few years later he helped her learn to ride horseback, a hobby she avidly pursued until recently when a relapse put her in the hospital.

Like others afflicted with spina bifida, a crippling birth defect that occurs when the spine fails to close during fetal development, Jill's life was threatened at birth by accumulations of fluid in her spinal canal and brain cavity. To prevent this condition, a shunt was implanted to allow accumulations of cerebrospinal fluid to drain harmlessly into her abdomen.

Jill recently underwent surgery to have a malfunction in the shunt corrected. While she recovers, her brother is researching the records of major corporations to determine which are most likely to donate money to provide relief for spina bifida victims and hopefully, find a cure for future victims. One potential cure, now in the early research stages, involves performing bone transplants to correct the defect while the child is still in the womb.

"We've still got a long way to go," Nizen says after a long session with the TRS-80. "It's an awful lot of work, but I cannot let this problem go unnoticed."

FOR THOSE WITH THE JOB HUNTING BLUES

With the slow economy there are a lot of folks pounding the pavements looking for work. Judith Lien, has decided to aid the ranks of the unemployed instead of join them, with the help of her TRS-80 Model II.

Two years ago, as a newcomer to Wisconsin, Lien decided to open a business offering resume writing for un-

(continued on page 170)

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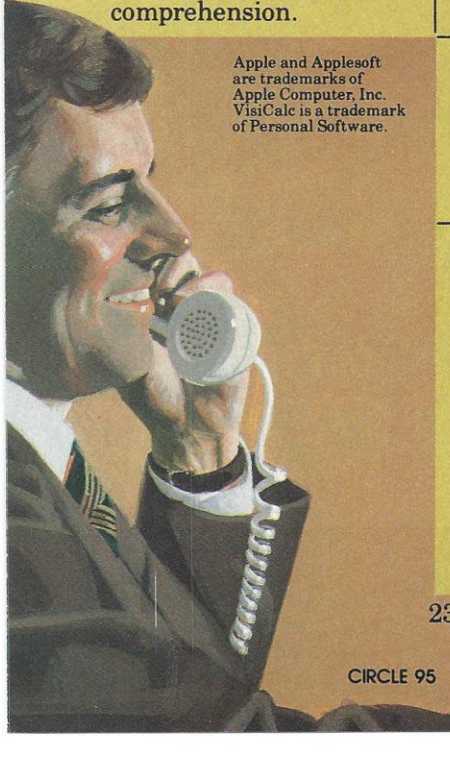
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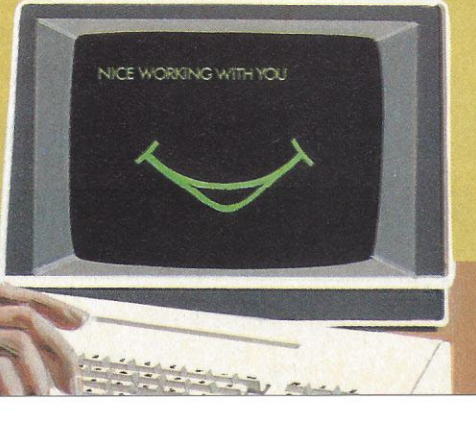
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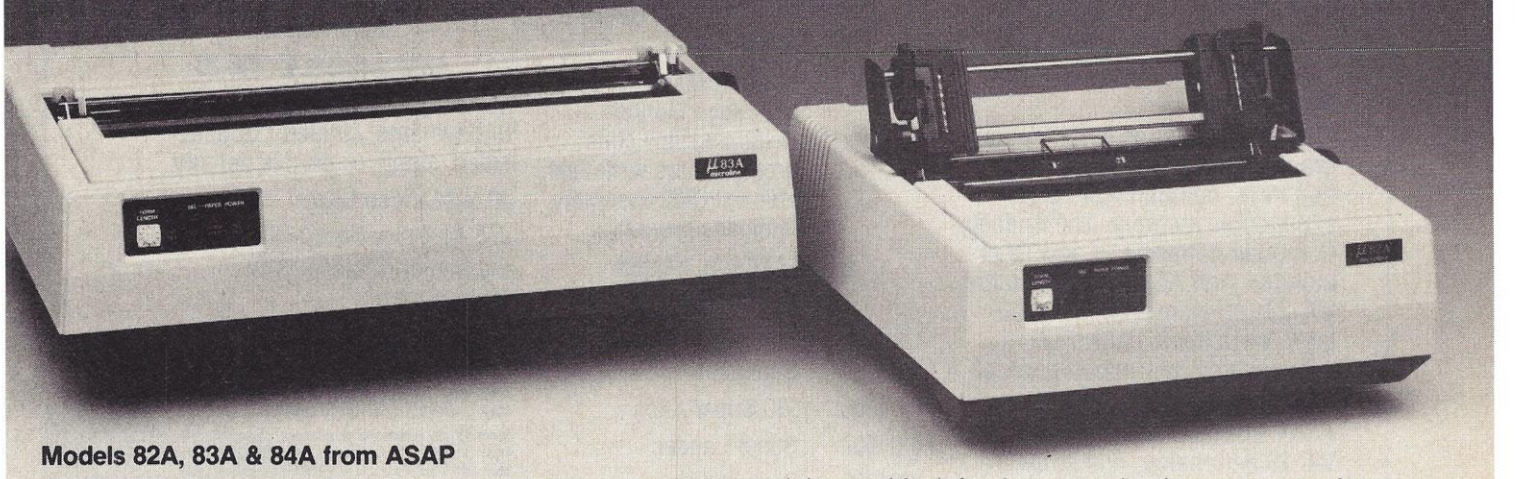
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CIRCLE 156

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Character set	Full 96-character ASCII	Full 96-character ASCII	Full 96-character ASCII
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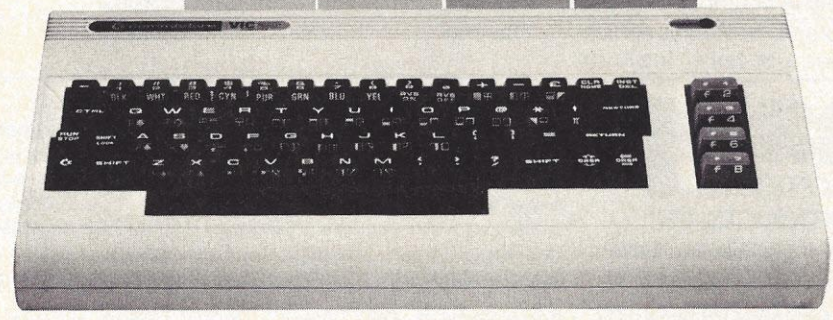
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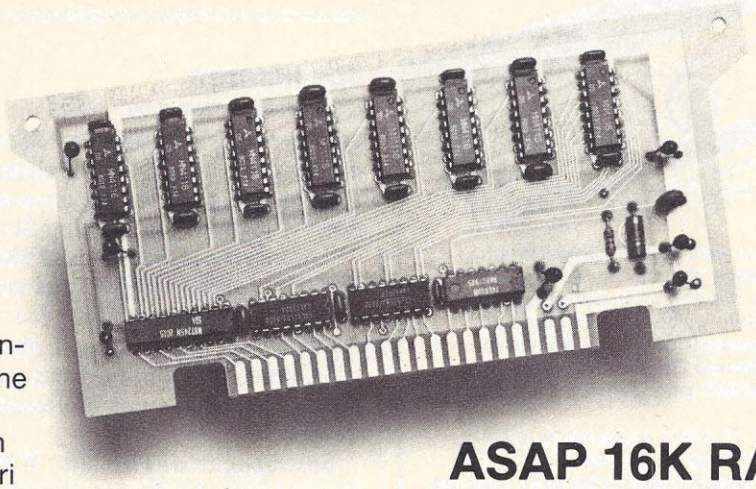
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1242-16	16 Hard Sector	163.8K	1/Double	10/$30.00
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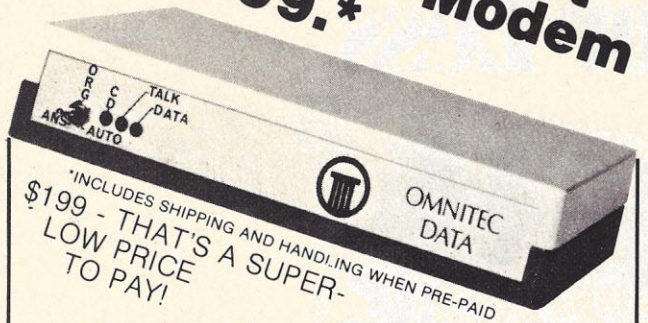
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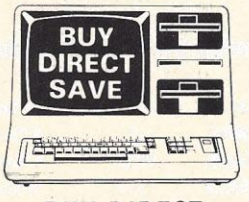
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CIRCLE 151

OUTLOOK

JOB HUNTING

(continued from page 164)

employed workers. She cleared two rooms of her home for office space, dusted off her electric typewriter, ran ads in all of the neighboring papers and hung a sign outside her door—"Word Shop Writing Service."

The request moved Lien's IBM Selectric into overdrive. But the resumes were only as perfect as her hasty typing allowed. She was wasting too much time (and paper) retyping, reformatting and photocopying. And the finished product looked far from professional. Lien needed a faster way to turn out professional looking resumes and documents.

She bought a TRS-80. With word-processing and record-keeping software, expansion disk drives and a daisy wheel printer, the business was now in overdrive.

Now that the computer was helping in the resume-writing business, Lien found new business opportunities everywhere she looked—putting newsletters together, assembling mailing lists, processing manuscripts, drafting documents and writing her own children's book.

The TRS-80 also helps in other areas. It scans farm records, helping Lien's husband make farm implement and agribusiness decisions. It also provides a training ground for her daughter's high-school typing and math classes. The computer has also been known to help Lien plot out a vegetable garden.

SENDING THE TRS-80 TO CAMP

The TRS-80 Microcomputer has been selected as the official computer of the Fifth Annual National Computer Camp. The Camp offers children aged 10–18 an opportunity for hands-on experience with educational and recreational computing. This year one- and two-week sessions will be held from July 11 to August 6, 1982 at two locations: Westminster Preparatory School in Simsbury, Conn., and Woodward Academy in Atlanta, Ga.

The National Computer Camp features small group instruction and ample "computer time" for all participants. Campers are grouped by their experience with computers, and no previous experience is necessary. Programs include computer instruction, game tournaments, workshops, movies and guest speakers, plus optional recreational activities including tennis, swimming, volleyball, soccer, softball and basketball.

An added feature of this year's camp is a special week-long session designed for children and adolescents with diabetes. This session of the camp, the first of its kind anywhere, will be held August 1 through 6 at the Simsbury, Conn., campsite. Members of the Division of Pediatric Endocrinology at The University of Connecticut Health Center will be on hand full time to provide medical support for the campers. Among the goals of this special camp are the evaluation and development of com-

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CIRCLE 110

puter programs to illustrate the interaction of exercise, dietary elements and insulin treatment in diabetes therapy.

Dr. Michael Zabinski of Fairfield University in Fairfield, Conn., established the National Computer Camp in 1977 as a way to give youngsters an opportunity to learn about computers first-hand in a recreational environment. Zabinski has also written several texts on computers, including *Introduction to TRS-80 Level II BASIC and Computer Programming* and *TRS-80 for Kids*.

Additional details on the National Computer Camp are available from: Michael Zabinski, Phd., at (203) 795-3049, or by writing: National Computer Camp, Box 624D, Orange, CT 06477.

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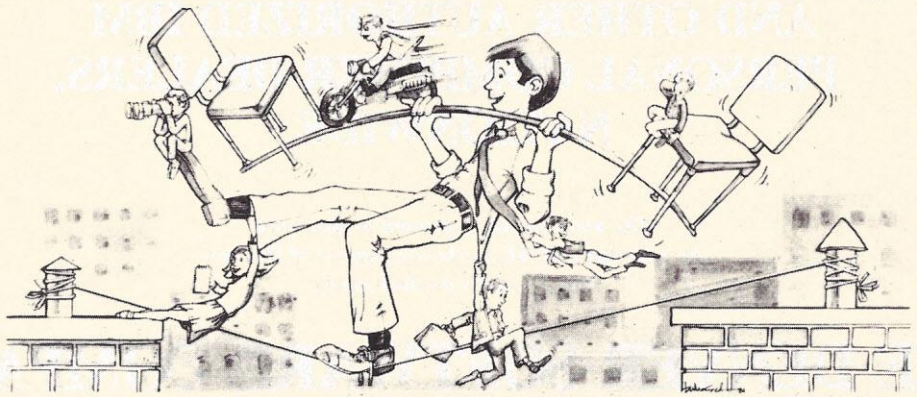
Field sales representatives are now getting help with many of their administrative chores through the efforts of a Minneapolis research facility, called the Dungeon. "The Dungeon is an R & D shop—which is rare if not unprecedented in the financial-services industry," boasts George M. Perry, vice president of information services for Investors Diversified Services (IDS), inventors of the facility.

Four researchers, working under the leadership of programmer analyst Kevin Fjelsted, use the Dungeon to test the latest computer equipment. Then, using this equipment, they review commercial programs and develop other programs themselves to help fill the needs of sales representatives.

The focus of the R&D efforts is to find products best suited to the needs of the salespeople in the field. Dennis Callahan, manager of electronic support planning, coordinates the effort, along with Bernadette (Bernie) Doherty, who manages the Dungeon and its model divisional sales office (DSO).

Most program research has been done on the Apple II

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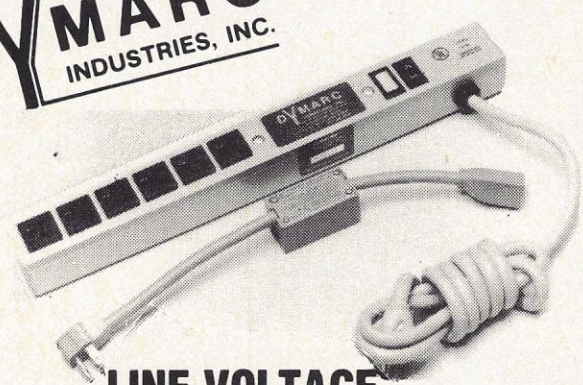
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Plus. Other computers tested in the lab come from IBM, Texas Instruments, Xerox and Radio Shack. The researchers have also tested dedicated word-processing machines, a variety of computer printers, graphics hardware, cut-sheet feeders (to feed stationery as single sheets) and envelope feeders, as well as video equipment.

A tour of the model DSO by potential clients begins with a demonstration of some of the features of the IDS Office of the Future. First on the agenda is word processing, using the commerical program, "The Executive Secretary."

Callahan explains that, "The word-processing program working with the data-base management system will go through a sales list and send letters only to clients and prospects. It makes the representative considerably more efficient since he just gets the letter writing in motion and can do other things while letters are being batted out."

Second in importance is the demonstration of the data-base manager, which shows potential clients how IDS would use it for call scheduling, tickler files, updating information on the client's files and entering new information, Callahan says. The demonstration of word processing and the data-base manager takes about an hour.

Doherty demonstrates, on the computer, how the various programs operate. After that, the person taking the tour receives hands-on training on the data-base management program, "The Data Factory."

Next, the tour moves on to a program developed by an IDS salesperson to analyze an individual representative's sales activity. "This shows how many client contacts a representative has made, breaks down the results by each call that's made and each presentation that's given," Callahan says. "It recapitulates the sales activity, and puts it into management information terms."

Installing the equipment is no more difficult than installing a home stereo, according to Callahan. His staff has prepared videotapes that train clients to use the letter-writing program and the client data-base program. They also provide a booklet on the representative activity analysis and one on access to the IDS network.

To date, there have been 51 Apple II Plus installations, 34 in divisional offices serving some 800 individual salespeople, 17 in offices of individual representatives; there have been six TRS-80 installations, one Xerox 860, one IBM Displaywriter, and one IBM System 6. Most installations are one computer, two disk drives and a letter- or correspondence-quality printer.

The R & D effort is paying off. The company recently did a survey of 30 of the installation sites. "All but four said it was meeting their expectations," according to Callahan. The four problem installations had personnel problems or lacked the time to update the data base. Optimistic predictions, Callahan says, suggest the number of installations could double in the near future.



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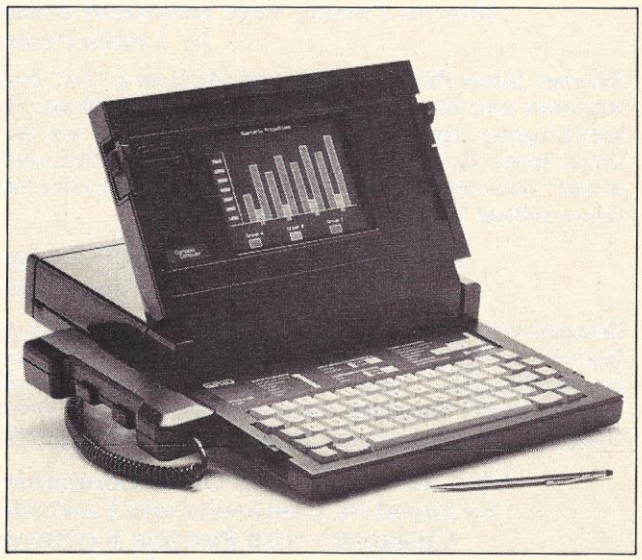
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Grid Systems And Olivetti Enter Market With New Systems

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It's a light weight. But at 9.25 pounds, the Compass computer, from two-year-old Grid Systems, promises to have an impact far beyond that which might be expected from its small size.

The small (11.5 inch by 15 inch by 2 inch) package includes a quarter Mbyte each of RAM and magnetic-bubble memory, a bit-mapped, flat-panel display and a 57-key keyboard. Also inside the magnesium case are two microprocessors (an 8086, the 16-bit CPU, and an 8087, a co-processor to handle communications chores) a 1200/300 baud modem and modular jacks that let the Compass be directly connected to the public phone system, and allow the connection of a telephone handset so the computer can be used as a power-assisted telephone, the company says.



All this hardware found itself inside the Compass because of Grid's design philosophy. Grid president John Ellenby says Compass is, "more than just a powerful, portable system, and more than a computer-network system. It's a total systems approach that integrates a new generation of portable management decision-making tools with the existing operational environment of large corporations."

Grid also says that a computer, if it is to be truly effective, must fit naturally on a manager's desk, be non-obtrusive during discussions, and protect the privacy of the displayed information.

Some might argue that the foregoing is all wet, and point to the large numbers of personal computers (large, bulky and obtrusive) that have been sold into the corporate world already. Whether the argument holds or not, though, Grid's product definition has given us a very impressive machine, especially when the bundled software is included in the reckoning.

It starts with four applications packages that Grid says are essential to sophisticated business applications. And indeed, it's likely that managers who use personal computers have variants of these packages. They are:

- Gridfile, a relational data base system;
- Gridplan, an electronic spreadsheet;
- Gridplot, a graphics program;
- Gridwrite, a word processor; and
- Gridpath, a project-management system.

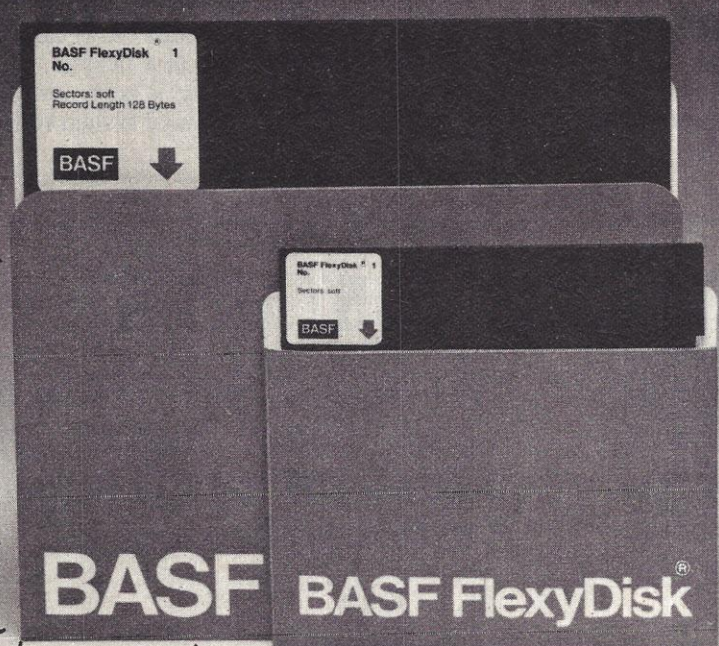
The applications packages share something called a leveraged learning interface. This interface, according to Glen Edens, Grid's vice president of development, allows all the packages to use a common set of 14 commands. There are four other commands that are specific to particular packages. So once a user has figured out how to use one of the applications programs, he should be able to use the others. And all the applications programs can share files, because the system has a common interchange file format.

Of particular note is the Gridplot package. The Compass computer is unique among personal computers in its display. That flat-panel device, which stands up for operation but folds into the package for transportation, is bit-mapped, which means that the graphics software can address each picture element (pixel) on the display. Thus, pictures can be drawn with a resolution of 320 by 240 dots on the 4.75 inch by 3.5 inch screen.

The modem previously mentioned provides communications capabilities. But a modem is useless without communications software, so Grid bundled that in, too. Communications packages that come with the Compass include six different IBM terminal emulators, and Teletype emulation, which will, essentially, turn the system into a dumb terminal, ready to communicate with almost any other machine.

One of the principal uses for the communications packages will be connecting with a central Compass system. There are two variants—Grid Central, maintained by Grid Systems, or Compass Central, essentially another Compass, which a large corporation might elect to put in place inside its own domain. But even if that happens,

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For the name of your nearest supplier, write BASF Systems, Crosby Drive, Bedford, MA 01730, or call 617-271-4030.

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users will still want to have access to Grid Central, since Grid will distribute its software—both new packages and updates to existing ones—over the Grid Central connection. So customers will be spared the agony of waiting for delivery of a floppy disk through the mail. And Grid thinks its electronic program distribution will also obviate the need to trek to the local computer store for the latest in super applications.

The price for the whole shootin' match—hardware and software—is $8150 each. Grid says it will market the system to large corporations, and will provide discounts for volume buys, depending on the yearly volume.

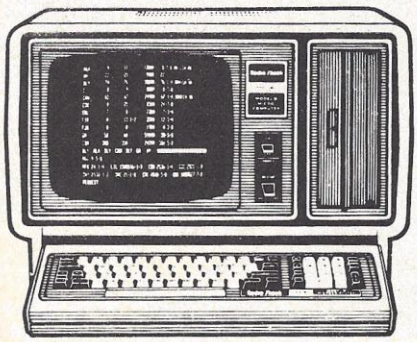
FOR MORE INFORMATION *Grid Systems, 2535 Garcia Ave., Mountain View, CA 94943. (415) 961-4800.*

AN AMERICAN COMPUTER FROM ITALY

Olivetti Corporation of typewriter and office equipment fame has waded right into the personal-computer market. Its entry, the M20, costs from $3000 to $6000 but a typical configuration costs $4600 and includes two disk drives, 128k of RAM, a full 16-bit Z8000 processor, a black-and-white monitor and a 100 cps (character-per-second) dot-matrix printer.

Like the Apple, the M20 is expandable and will support color. The machine comes with three expansion slots for additional on-board memory in 32k or 128k increments, up to a total of 512k of RAM. Parallel and serial interfaces are standard, with an option of adding an IEEE 488, plus two additional RS-232-C interfaces or two additional current-loop serial interfaces. A color monitor with an 8-color palette is expected by September or October and, Olivetti claims, will have the same high resolution as the black-and-white monitor: 512h × 256v. Displays are formatted at 80-columns by 25-lines or 64-columns by 16-lines (the latter so it can run Radio Shack software). This adds up to a flexible, highly alterable computer.

Disk storage is good and Olivetti makes the drives itself. The minimal system resembles an Apple III coming



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in with at least one drive of 320k of unformattted storage or 286k formatted. Dealers can pop in a second drive at a later date if desired, or sell the machine with two drives. In December Olivetti plans to introduce a doubling option for the drives, bringing them up to 640k of storage per drive. This high capacity is basically state-of-the-art for 5 1/4-inch drives. And also by December, Olivetti plans to introduce a small Winchester hard disk drive with 11 Mb unformatted and 8.8 Mb formatted capacity. No price has yet been announced for these additions.

Ergonomics are attended to with a monitor the user can move around on its 3-foot cable, a keyboard impossible to "out-type" (that's called N-key rollover—meaning it will remember any number of keys you strike past what's showing on the screen without dropping any), and tactile feedback (a physical click).

The simplest configuration lists for $2965. This includes Olivetti's own operating system, PCOS; one disk drive; a keyboard; a CPU; and a monitor.

The first software expected for the M20 is PCOS, which Olivetti claims uses the strengths of the machine's powerful Z8000 16-bit processor. IBM Personal Computer compatibility will come from a Softcard-type approach in the August/September timeframe, with an 8086 processor like the IBM's on a peripheral card. And Digital Research will provide XLT-86 to allow the computer to run both 8- and 16-bit CP/M software. Microsoft BASIC 5.2 will be available immediately, followed by an IBM-compatible Pascal, and FORTRAN. Wordstar will be available too, with an enhanced version expected later in the year.

FOR MORE INFORMATION *Olivetti Corp., 155 White Plains Red, Tarrytown, NY 10591—or their nearest Olivetti office machine dealer.*

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A double-density upgrade kit and Portable Power are available for the Osborne 1, doubling this portable

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Edu-Ware Services, Inc., P.O. Box 22222, Agoura, CA 91301 (213) 346-6783

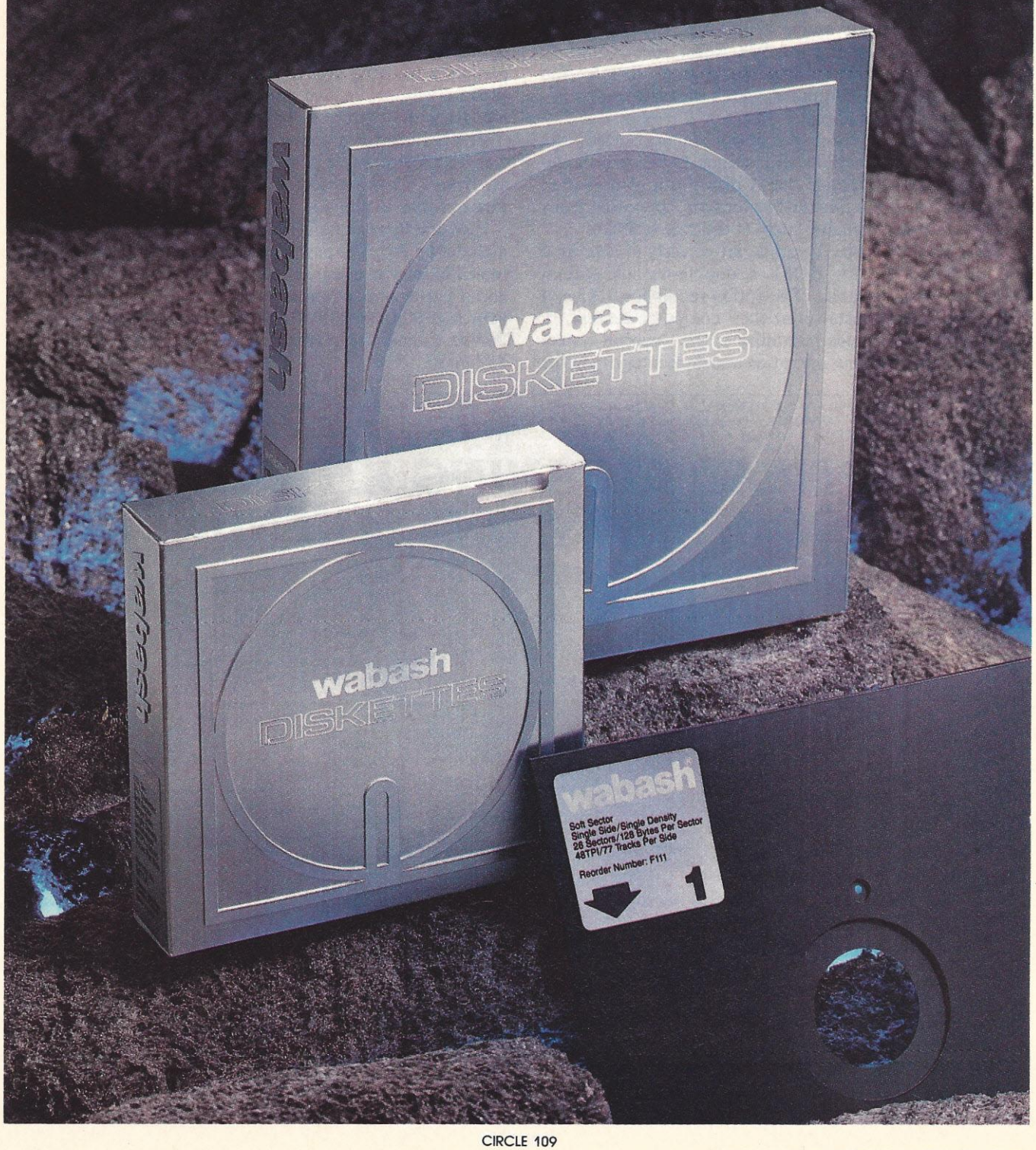
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business computer's memory capacity as well as making it even more flexible for the traveler. OCC's newest options allow Osborne users to work with large complicated programs as well as operate in inaccessible locations.

The double-density option doubles the capacity of the computer from the existing 92k (after formatting) to 184k of storage. In addition, the upgrade doubles the transfer rate of the computer, which means speedier access to stored information.

With the double-density option incorporated, the Osborne 1 is compatible with either Osborne's single-density or double-density floppy disks, or a combination of the two. In addition to the two formats, the option reads and writes other formats, such as the Xerox 820.

The Double Density Upgrade kit consists of a printed circuit board, 2732A ROM, a double-density system diskette and three cables. The option retails for $185 and OCC dealers will install it at their computer centers.

Portable Power adds reliability to the Osborne system by ensuring continuous operation and data integrity in the event of a power failure. Should power be interrupted, Portable Power automatically switches from AC to DC power, functioning as an Uninterruptable Power Source (UPS).

Up to one hour of battery support is provided by the option. When the energy level of the battery is near depletion, a warning buzzer sounds, indicating that power support will end in five minutes. The AC charger fully recharges the battery in 16 hours.

The battery-to-computer cable features an automobile cigarette lighter-style plug, which allows the user to operate from a 12-volt automobile battery when the Portable Power cable is plugged into the car's cigarette lighter.

Portable Power retails for $390, weighs 4.6 pounds and includes an AC/DC power assembly, a high-performance sealed battery in a leather carrying case, an AC charger, and a battery-to-computer cable.

FOR MORE INFORMATION *Osborne Computer Corp., 26500 Corporate Ave., Hayward, CA 94545; (415) 887-8080.*

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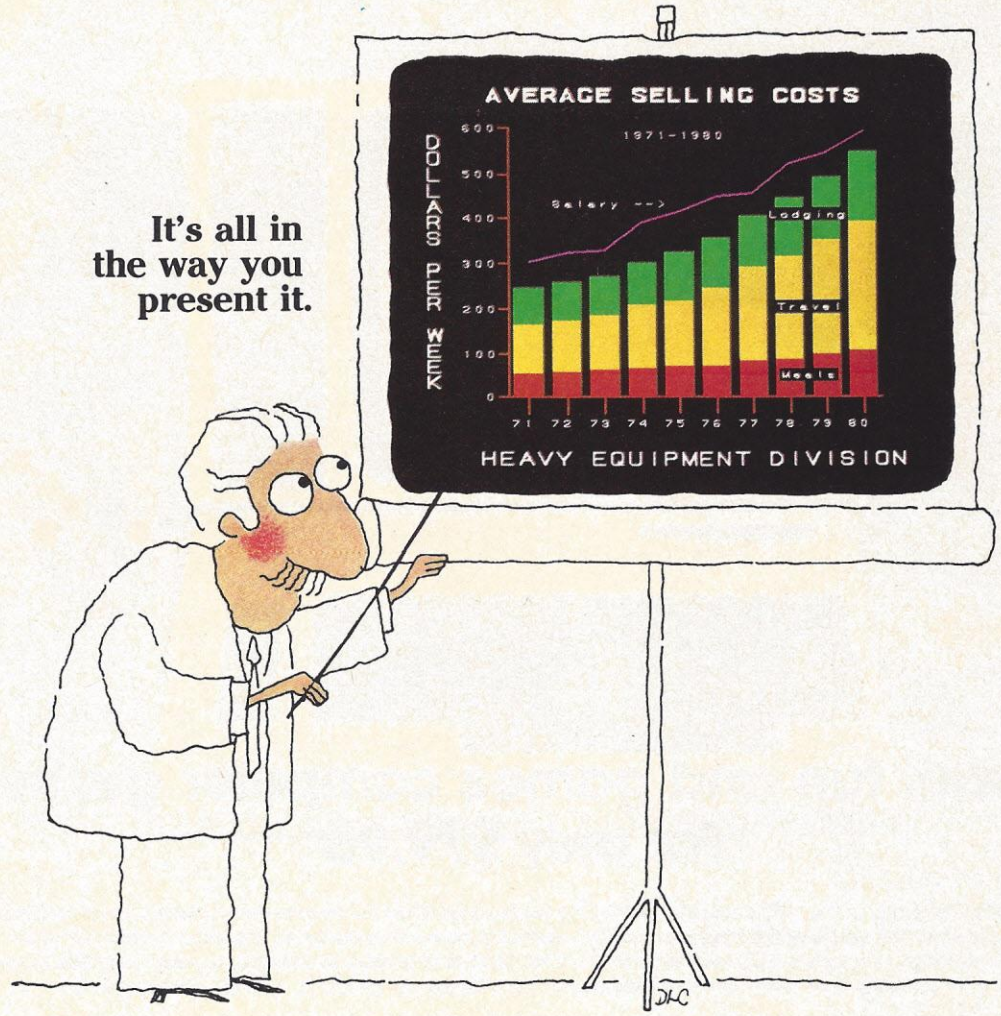
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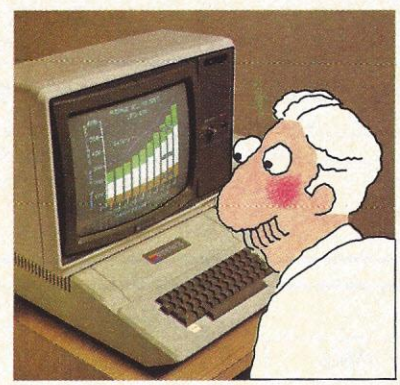
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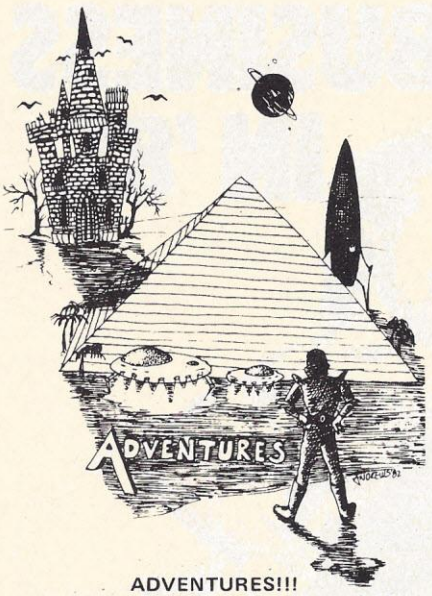
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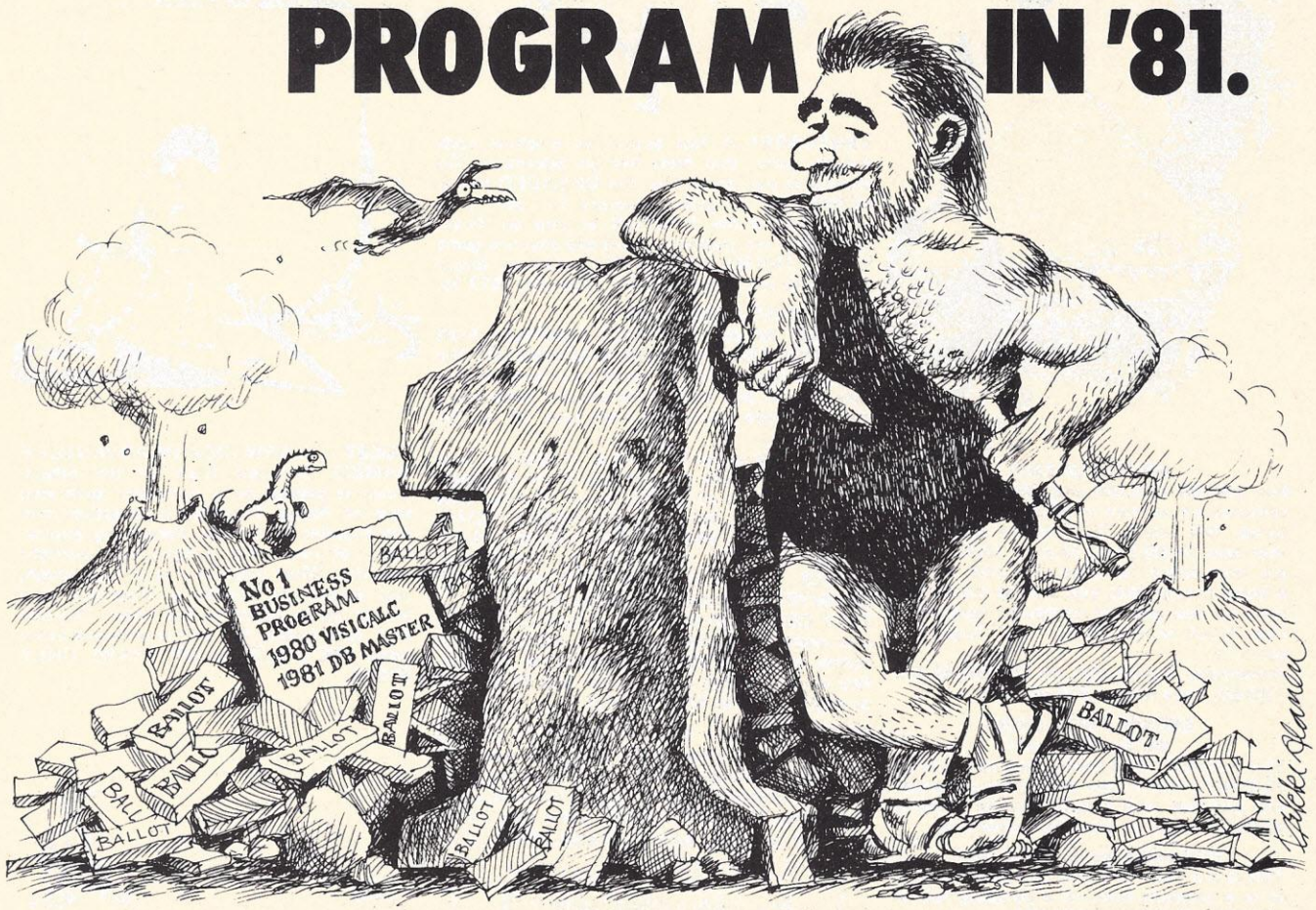
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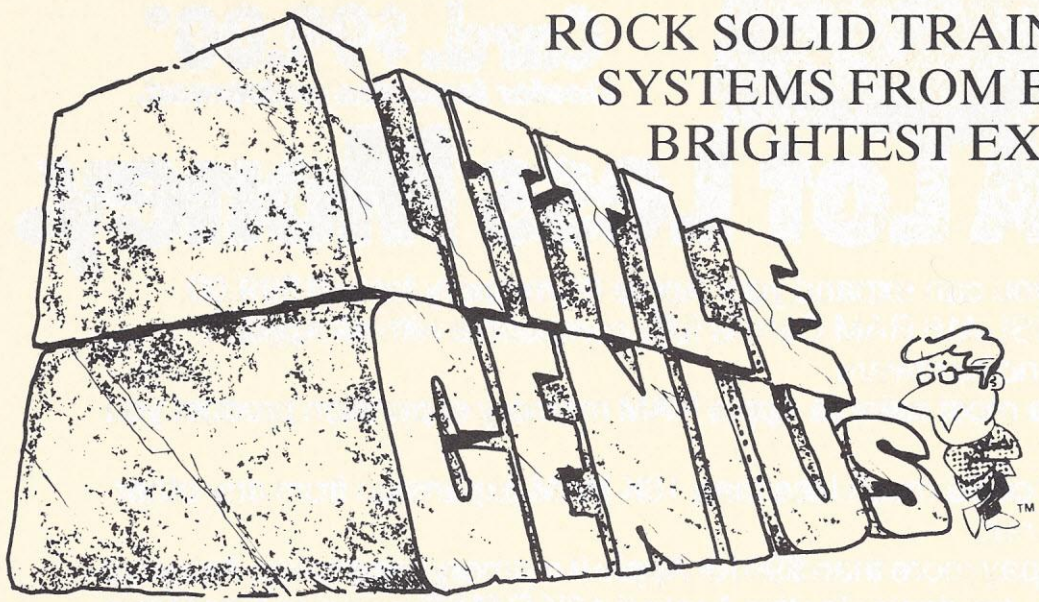
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PRODUCTS/FEATURES/PRICE	COMPANY/AVAILABILITY
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M20 expandable system that supports color from $3000	Olivetti Corp. Tarrytown, NY 10591 retail see story on page 178 CIRCLE 299
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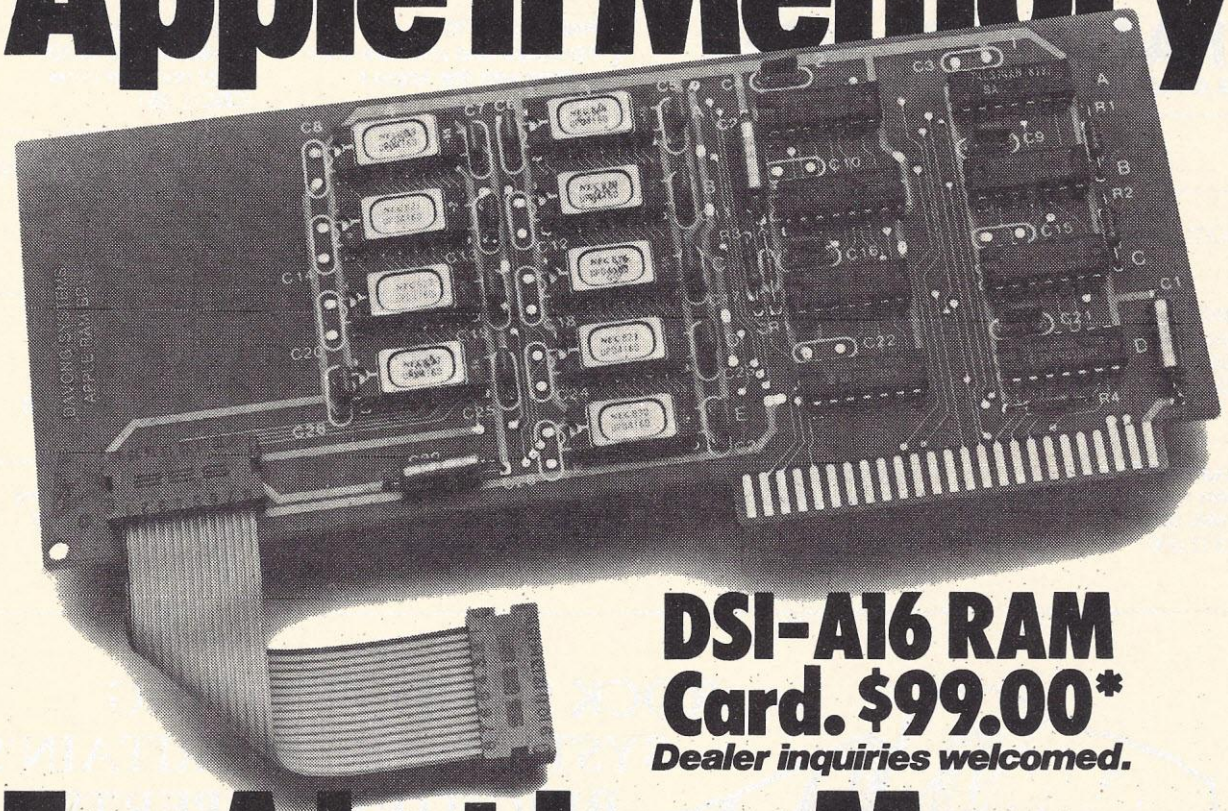
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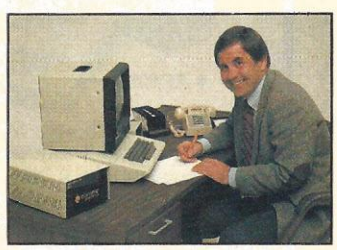
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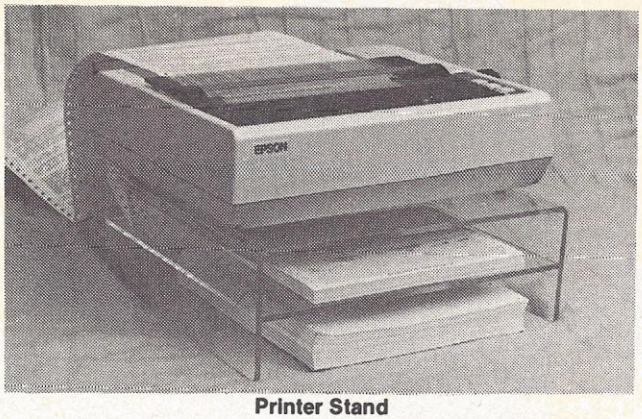
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HARDWARE INDEX

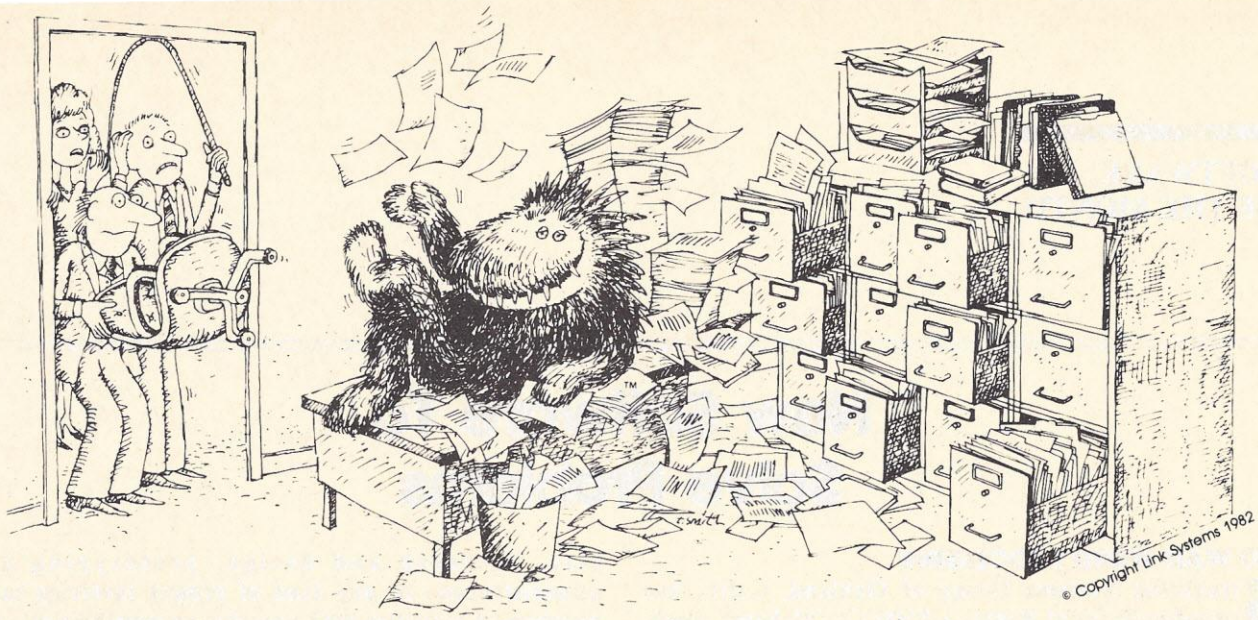
for S100-bus computers $450	mail order CIRCLE 272
Double-Density Upgrade Kit doubles memory capacity from 92k to 184k for Osborne 1 $185	Osborne Computer Co., Hayward, CA 94545 retail see story on page 180 CIRCLE 297

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DESK CONSOLE measures $8\frac{1}{2} \times 16 \times 2$ 3/4-inches for Sharp PC 1211 and TRS-80 Pocket Computer $19.95	FOX/WALKER Montclair, CA 91763 mail order CIRCLE 287

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IB501, IB502 carrying case for portability and storage for IBM Personal Computer $128, $99	Computer Case Co. Columbus, OH 43213 retail or mail order CIRCLE 290
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The Portrait Subsystem create computer portraits for Apple II $1175	Computer Station St. Louis, MO 63141 retail CIRCLE 294



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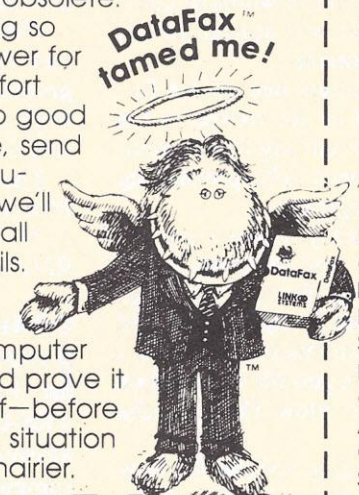
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CIRCLE 48

New Software To Solve Problems

NO WAIT WORD PROCESSING

Structured Systems Group of Oakland, Calif., has introduced Word Right, a $500 CP/M-based word-processing program that requires at least 56k of RAM—although 64k is better. The package was designed to be useable within an hour after it's received, and has plain-English prompts at every step.

Word Right will read in files it does not create, so users can work with documents created by their previous word processor. It also queries about control characters it doesn't understand, and all printing and file management is done within the software; there is no need to dive into the intricacies of CP/M.

This is a disk-based program. It is slower than RAM-based programs in some ways, but most people who write long documents feel the fastest word processors automatically use the disks.

Another feature of the program is proportional spacing. Few CP/M machines, if any, can show proportional letter spacing. Word Right limits the number of words or characters on a line to the number that will appear on the proportionally spaced, printed document.

In the same spirit, control characters needed for formatting the printing can be viewed or not viewed as the user desires, at any time. Printing or editing files is managed from the main file; there is no need to keep switching between editing and formatting programs.

The program, SSG claims, is as easy to learn and use as much more limited programs. For instance, small stick-ons are provided to put on the front of the keys so their command functions need not be memorized and rememorized. A HELP function also lets the user query the program about any command. He gets his information on the screen without having to plow through the documentation.

Customer support includes automatic updates for buyers of the annual maintenance contract. Back-up is no problem—the software has no protection beyond the serial number.

FOR MORE INFORMATION *Structured Systems Group, 5204 Claremont, Oakland, CA 94618; (415) 547-1567.*

MANAGEMENT STAYS ON TOP

PMS-II, a full scale critical-path project-management system, is available for any personal-computer system that supports the CP/M or MP/M operating systems.

The critical-path method of project management has been successfully employed for many years by firms to manage the completion of complex projects. Construction, research and design, prototyping and administrative—or any kind of project involving large numbers of activities with complex responsibilities—can be managed by the critical-path method.

Given the complexity of the management problem and the large amount of computing power required to perform critical-path analysis, people who wanted to use this sophisticated management technique were tied to expensive mainframes, minicomputers or even more expensive time-sharing services. The low cost and portability of personal-computer systems makes them practical and economical for many companies to unhook from their expensive mainframe or time-sharing services, and place project management capability at the job site or in the project manager's own department, by using PMS-II.

The speed of PMS-II's computation and report generation provide rapid turnaround to give a project manager the luxury of massaging the project network—playing out various "what if" scenarios—until all dates and durations are fully optimized.

PMS-II prints activity reports with extensive sorting and data selection options, standard GANTT charts, graphic and tabular funding schedules, and even the network diagram itself. This eliminates the need for extensive diagram redrafting every time changes occur.

The price is $1295.

FOR MORE INFORMATION *North America MICA, Inc., 11772 Sorrento Valley Rd., Suite 240, San Diego, CA 92121; (714) 481-6998.*

CONVERT AND COMMUNICATE

LogOn, a communications software package, converts the IBM Personal Computer, Apple II, Apple III, or TRS-80 Model II Microcomputer into an auto-dial, auto-answer intelligent terminal for communication with other computers.

Users can exchange messages, electronic mail, program files or graphic images at 30 to 120 characters per second, depending on the equipment used. The package features self-explanatory menus and allows users to send and receive text or binary files.

A permanent directory of frequently-called numbers (up to 30 digits) and computer configurations (baud rate, parity, etc.) can also be constructed. A computer is selected from a menu and LogOn does the rest, automatically redialing if busy, and performing automatic retransmission of blocks of data.

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  - Income/expense (Budget report)
  - Standard names & purpose codes
  - Standard addresses
  - Chart of accounts
  - Income/expense vs time graph
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Personal Finance Master is available at your local dealer or you may order directly from Spectrum Software. PFM is supplied on a standard DOS 3.3 diskette and includes an extensive 50 page bound instruction manual. PFM requires an Apple II with Applesoft in Rom or an Apple II Plus, 48K RAM, one disk drive (DOS 3.3) and an 80 column or larger printer (optional). If you would like additional information write for our free PFM Factsheet.

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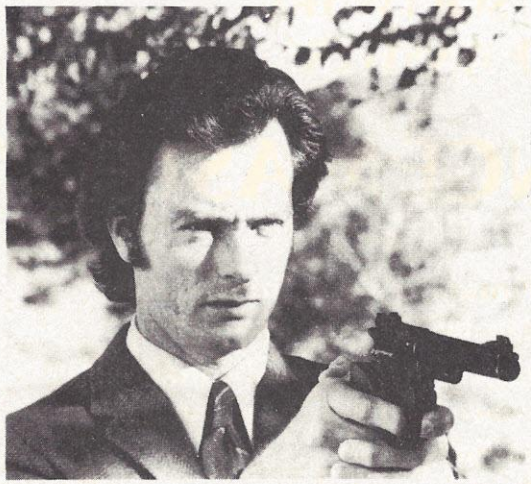


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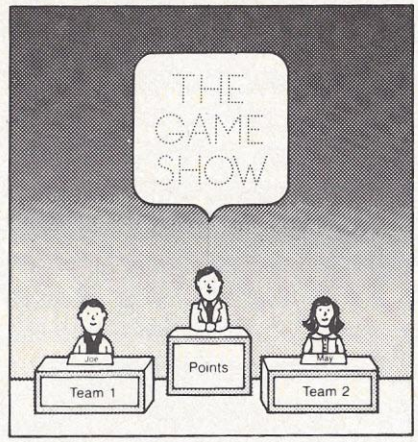
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SOFTWARE OF THE MONTH

LogOn features a 19k work space (buffer) to capture online sessions while displaying data to the CRT or printer, and stores data on diskette. Users can also scroll through the work space to find the latest electronic mail messages, "browse" through UPI news on The Source, "chat" or exchange comments, or even temporarily exit to review a directory of files, reconfigure the system, or run another program.

LogOn allows for upper- and lowercase characters and a selectable number of CRT display columns (1 to 80). Keyboard characters can be redefined to any ASCII character, such as a frequently-used correction character or a character not found on the normal keyboard. LogOn also supports most acoustic couplers and modems.

The system interfaces to Ferox Microsystems' Micro-DSS/Finance financial modeling and GraphPower graphics plotting packages. The combination of these packages provides financial modeling combined with consolidation of data and menu-driven graphic display of the results.

LogOn is written in UCSD Pascal and can be transported to any UCSD Pascal-based personal computer, minicomputer or mainframe, making it fully compatible with future growth needs.

The package costs $150.

FOR MORE INFORMATION *Ferox Microsystems, 1701 N. Ft. Myer Dr., Suite 611, Arlington, VA 22209; (703) 841-0800.*

RADIO SHACK DELIVERS NEW EDUCATIONAL EXERCISES

A bevy of educational software debuts from the folks at Radio Shack. The scope of the material ranges from pre-algebra concepts, calculus and geometry to lesson development and BASIC programming.

The first package, Essential Math Vol. II, consists of self-paced exercises that help students at the grade 7–12 level build skills involving fractions, decimals and other pre-algebra math concepts. Screen messages both reward correct answers and help by identifying incorrect answers as the student moves through the exercises at his own pace. Scores are reported at the end of each lesson.

Essential Math requires a TRS-80 Model I or III 16k tape system, or a Model I or Model III 32k disk system. The price is $199.

The calculus package, Investigations in Integral Calculus, is designed for students with a background in algebra and some familiarity with trigonometry and logarithms. This program may be used at the end of an Algebra II course, as an independent study unit, as part of a survey course or as an introduction to beginning calculus.

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Seattle Computer has a winning card for owners of the Personal Computer. It's RAM+ the new expansion memory that can make your Personal Computer unforgettable by adding up to 256K of memory.

And RAM+ cards can put money on the table. Each comes with a built-in RS-232 serial port—which would cost $150 from IBM. This serial port uses IBM supplied software and can be used as IBM COM1 or COM2 leaving an open slot for further additions—like another RAM+ card.

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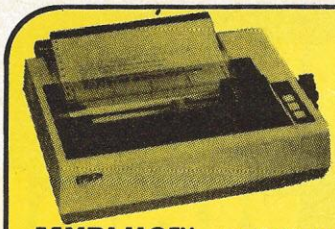
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CIRCLE 132

SOFTWARE OF THE MONTH

The program has three main sections: a user's guide, which provides students with hands-on demonstrations; a series of 14 "Selected Investigations" that include the trapezoidal rule, integral notation, negative integrals and integrals of the exponential function; and an Answer Key complete with thorough explanations and graphs.

Investigations in Integral Calculus requires a TRS-80 Model I or III tape or disk system with a minimum of 32k of memory. The price is $39.95.

For students studying plane analytic geometry concepts, there is a new program called Plane Analytic Geometry. The software allows students to choose practice problems related to either straight line or conic sections, and includes hyperbolas, circles, ellipses and parabolas.

Students are rewarded with reinforcement messages for correct answers, and helpful hints prompt them to try again when they make a mistake. Performance reports are available after each practice session. Important plane analytic geometry concepts are summarized for student review in a special Concepts section in the manual.

Plane Analytic Geometry requires a TRS-80 Model I or III 16k tape system, or a disk system with a minimum of 32k. The price is $39.95.

To allow instructors to create sophisticated educational materials without previous computer experience, Radio Shack has introduced TRS-80 Author I, a screen-oriented lesson-development system that features full-screen editing and graphics plus student management and score keeping capabilities.

The program has four modules—Author, Teach, Print/Verify and Student—each designed for a specific use. Lessons are created by the instructor in the Author module and are presented in the Teach module. The Print/Verify module allows the instructor to check for errors in a lesson, and student records are maintained in the Student module.

Each lesson created with TRS-80 Author I includes four "pages." The Text page offers a student lesson materials in text form, and can incorporate both alphanumeric and graphics characters. A Question page follows Text pages, and permits any of three answering methods. Glossary pages let the students request definitions during a lesson, and a Control page defines control of the lesson flow through conditional or unconditional branching.

The program requires a TRS-80 Model I or III disk system with a minimum of 32k. The price is $149.95.

Along the same lines is a new command-oriented authoring language called MicroPILOT, which allows teachers with no previous computer experience to create their own computer-assisted instruction materials.

MicroPILOT allows educators to create lessons, quizzes, student drills and exercises for a wide range of subject areas. The language also makes possible student-

(continued on page 204)

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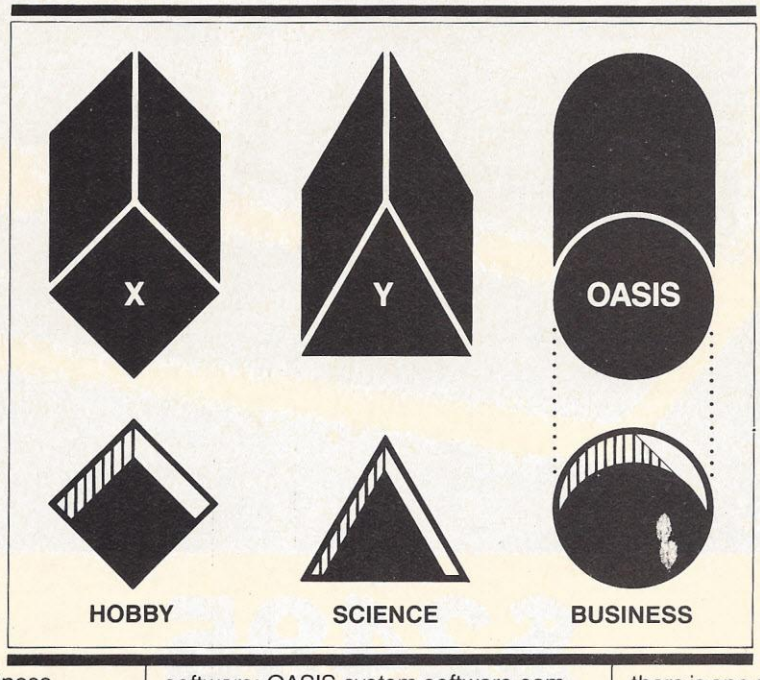
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Data integrity—a challenge for any multi-user system—is insured by OASIS File & *Automatic* Record Locking. With it, normally all users can view a record at the same time. BUT, if the record is being updated by one user, other users are automatically denied access until the update is complete. That means data is always accurate and up-to-date. And it's still another OASIS exclusive.

For system security, there's OASIS Logon, Password & Privilege Level. User Accounting keeps track of who used the system, when. *(OASIS exact business fit #4: data integrity/system security.)*

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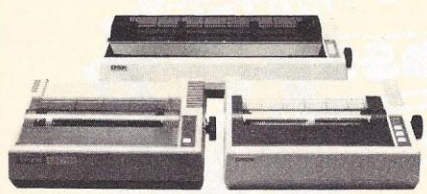
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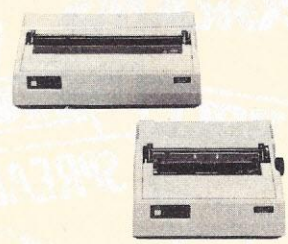
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SOFTWARE OF THE MONTH

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This courseware requires a TRS-80 Model I or III, and is priced at $199.

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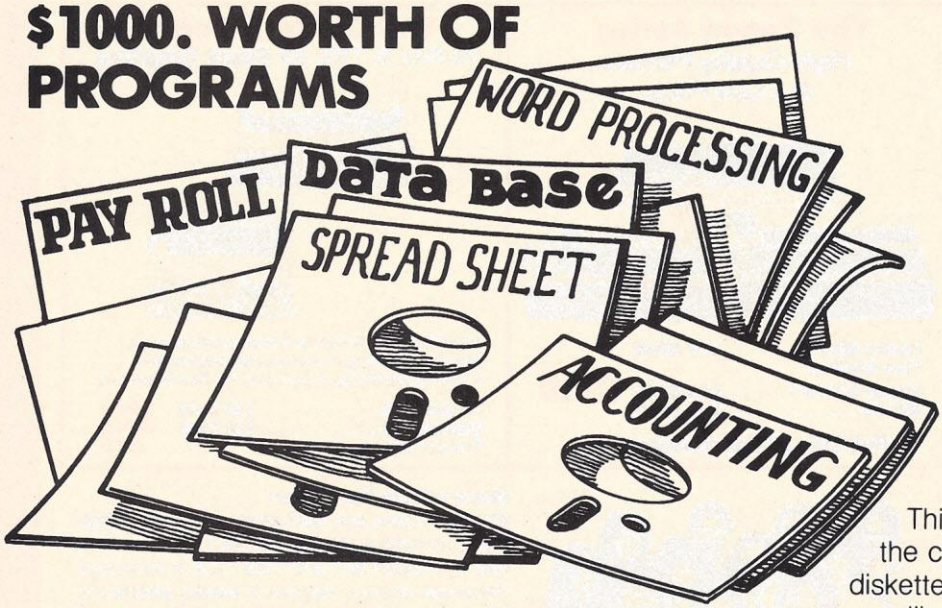
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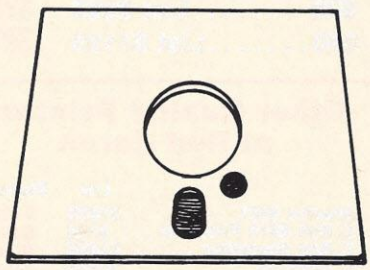
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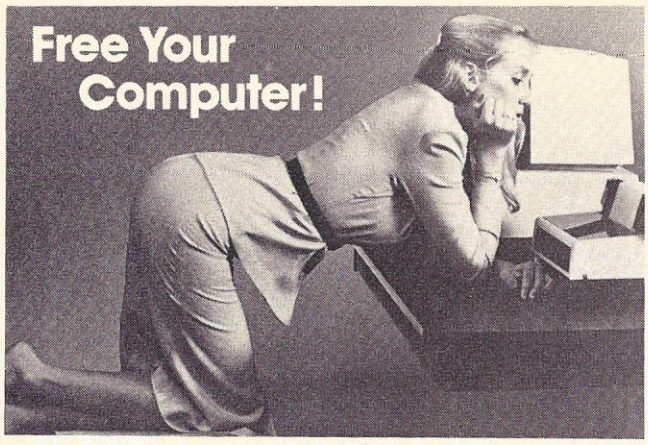
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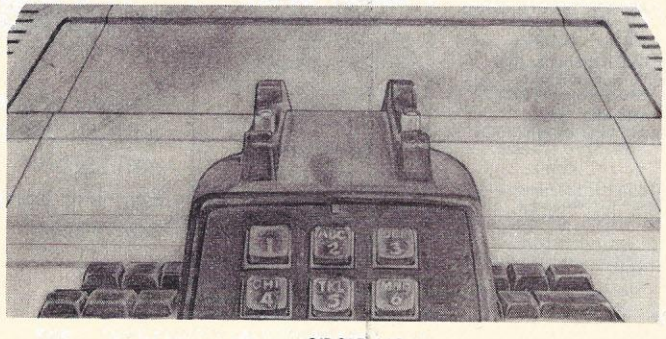
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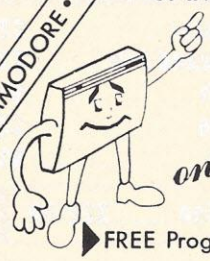
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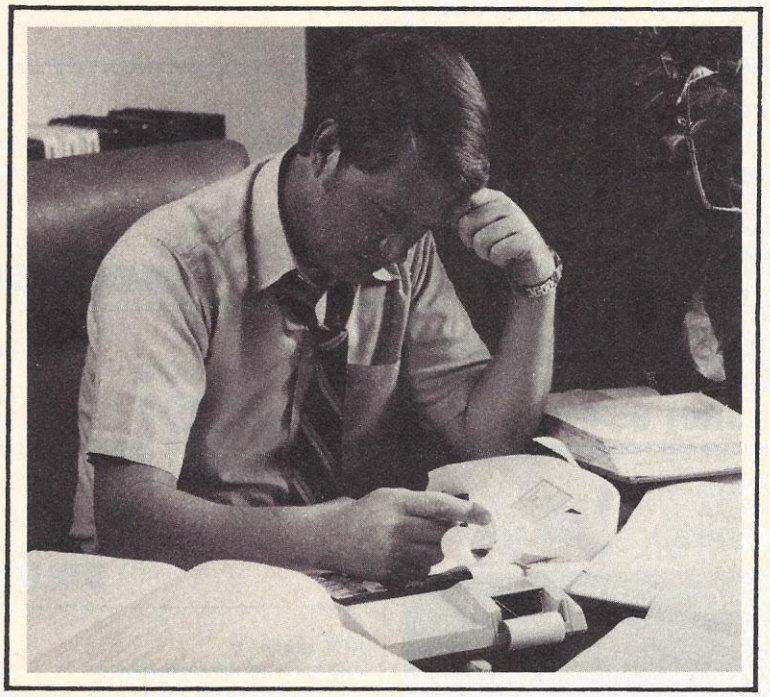
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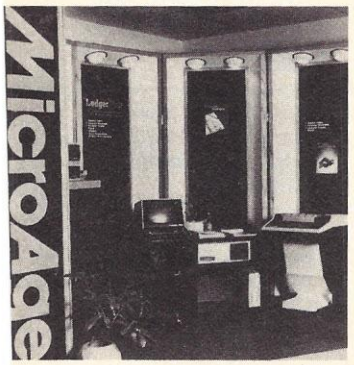
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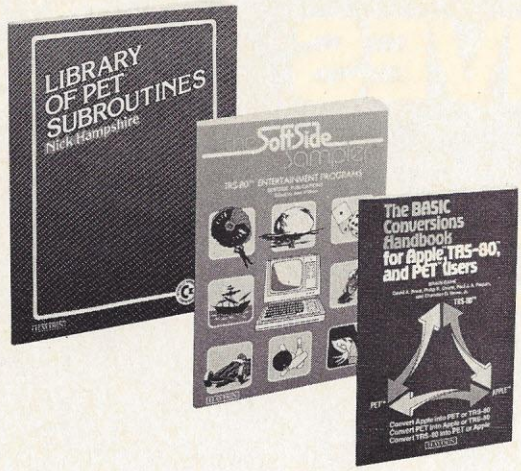
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(continued on page 216)



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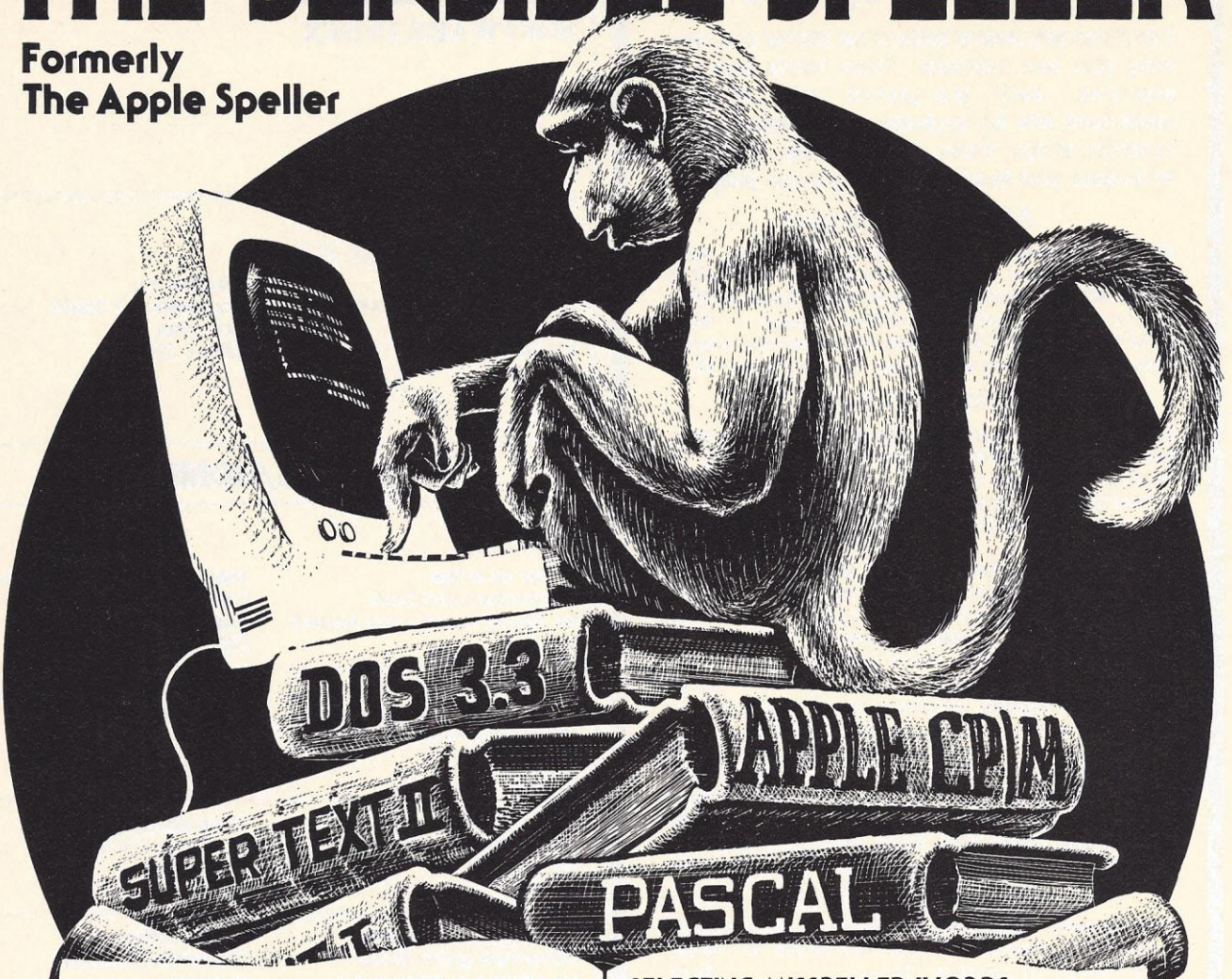
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(continued from page 212)

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Computerland/W. Palm Beach (305) 684-3338
Computer Scene (305) 945-1014
Computer Scene (305) 238-7238
Electronic Equipment Co. (305) 871-3500
H.I.S. Computermation (305) 254-9399
Lighthouse Book Store (305) 781-1945
Baron Electronic Sales (305) 556-1300
Computerland (813) 971-1680
Computerland (813) 392-0771
Computerland (813) 785-5579
Extra Extra Newstand (813) 886-1802
Henry's News Stand (813) 536-3863
Micro Computer System Inc. (813) 879-4301
Poling Place (813) 541-2729
Computerland (904) 224-9341
Computerland (904) 731-2471
Computer Shack (904) 396-1800
Computer Store/Gulf Breeze (904) 932-0660
Computer Sys. Resource (904) 376-4276
Florida Book Store (904) 376-6066
Goerings Book Ctr. (904) 378-0363
Grice Electrs. Inc. (904) 477-8100
Williams Radio and TV (904) 354-5460
GEORGIA
Atlanta Computer Mart (404) 455-0647
Baileys Computer Shop (404) 790-5771
Competitive Edge, Inc. (404) 487-6460
Computerland/Atlanta (404) 953-0406
Guild News Agency (404) 252-4166
Micro-Graphics Systems, Inc. (404) 790-5771
Computer Gazebo (912) 233-8888
Electronics 21 Inc. (912) 352-0585
HAWAII
Amtec Inc. (808) 955-7429
Computer Center (808) 448-2171
Computerland/Hawaii (808) 521-8002
Data 1 Microcomputer (808) 946-1733
Radio Shack No. 7086 (808) 487-1509
Univ. of Hawaii Bookstore (808) 948-8022
IOWA
Memory Bank (319) 386-3330
Computerland of Cedar Falls (319) 277-1700
The Partstore, Mario Iowa (319) 373-1803
Business Data Processing (515) 276-8858
IDAHO
Computer Co. Inc. (208) 375-9381
Computerland (208) 344-5545
Electronic Specialties (208) 376-5040
Northwest Computer Ctr. (208) 375-6681
ILLINOIS
Byte Shop (217) 352-2323
Computerland/Champaign (217) 359-0895
Computer-Ease (309) 833-3886
Wallace Micro-Mart Inc. (309) 685-7876
ABC Byte Shop (312) 673-3550
Book Market (312) 944 3358
Book Market (312) 440-4475
Byte Shop (312) 579-0920
Chicago Main Newstand (312) 864-2727
Complete Computing (312) 620-0808
Compushop (312) 593-1800
Computerland (312) 949-1300
Computerland (312) 967-1714
Computerland (312) 422-8080
Computerland/Naperville (312) 369-3511
Computerland/Northbrook (312) 272-4703
Computerland/Schaumburg (312) 253-3009
Data Domain/Schaumburg (312) 397-8700
Digitalworld (312) 628-9222
Erickson Communication (312) 631-5181
Illinois Microcomputer (312) 420-8813
Kroch's & Brentano's (312) 332-7500
Micro Computer Ctr./Geneva (312) 232-1545
Nabih's Inc. (312) 869-6140
Northbrook Computers (312) 480-9190
Oak Brook Computer Ctr. (312) 941-9005
Page One (312) 529-9060
Prairie News Agency (312) 384-5350
The Book Store (312) 255-8040
Videomart Inc. (312) 861-1255
Wine Micro Computers (312) 420-8813
Univ. Bookstore (618) 536-3321
Alpine Computer Ctr. (815) 229-0200
Appletree Computer (815) 758-8666
Computerland/Joliet (815) 741-3303
Computer Store/Rockford (815) 962-7580
INDIANA
Acro Electronics (219) 397-8681
Bytrex (219) 485-7511
Computerland (219) 256-5688
Computerland (219) 483-8107
Computerland (219) 769-8120
Computer Plus (219) 865-3930
Computer Room (219) 277-1515
Data Base (219) 484-3164
Computerland/Anderson (317) 649-1122
Computer Store (317) 662-9994
Graham Electrs. (317) 634-8202
Heathkit Electr. Ctrs. (317) 257-4321
Data Domain (812) 334-3607
Hoosier Electrs. (812) 232-8508
KANSAS
Amateur Radio Equip. (316) 264-9166
Computerland Hutchinson (316) 662-6832
Computerland (316) 684-3870
High Technology/Wichita (316) 262-0315
Gosub Int'l Inc. (316) 265-9858
Book Nook (913) no listing
Computerland (913) 492-8882
Computerland/Topeka (913) 267-6530
Computerland (913) 841-8611
Online Computer Centers (913) 341-6651
Personal Computer Ctr. (913) 649-5942
The Computer Room/Beatty (913) 341-3500
KENTUCKY
Computer Emporium (502) 589-9482
Heathkit Electr. (502) 245-7811
Computer Place (606) 276-3594
LOUISIANA
Computer Shoppe Inc. (504) 454-6600
MAINE
Retail Computer Ctr. (207) 669-6736
MARYLAND
Bethesda Computers (301) 657-1992
Chafitz (301) 340-3300
Computer Crossroads (301) 730-5513
Computers Etc. (301) 268-5801
Computers Etc. (301) 268-5801
Computers Etc. (301) 296-0520
Computerland (301) 340-8484
Computerland/Towson (301) 337-5555
Computer Unlimited (301) 321-1553
Fredericks Computer Products (301) 694-8884
Heathkit Electrs. (301) 881-5420
Komar Ltd. (301) 675-2200
Logical Choice (301) 465-3175
Micro Age (301) 762-7585
Personalized Computer Consul. (301) 840-0412
Program Store/Baltimore (301) 944-0200
Radio Shack (301) 224-2900
The Comm. Center (301) 792-0600
Wills Computer Store (301) 423-4525
MASSACHUSETTS
Computer Source (413) 443-7181
Retail Computer Ctr. (413) 589-0106
Small Computer Data Sys. (413) 592-6600
Computer City (617) 755-5464
Computer City (617) 875-8126
Computer City (617) 273-3146
Computer City (617) 242-3350
Computer City (617) 826-9217
Computer City (617) 774-7118
Computerland/Boston (617) 235-6652
Computerland/Boston (617) 482-6033
Computer Store (617) 232-5470
Computer Store (617) 354-4599
Harvest Computer (617) 547-3289
Heathkit Electrs. (617) 237-1510
Heathkit Electrs. (617) 531-9330
Land of Electronics (617) 581-3133
New England Electronics CO (617) 449-1765
Ni-Ni's Corner, Inc. (617) 547-3558
Out of Town News (617) 354-7777
Palace Spa (617) 783-5858
Retail Computer Ctr (617) 935-8060
Small Business Group (617) 692-3800
Video Station (617) 933-1445
YDI Electrs. (617) 449-1005
MICHIGAN
Binary Corp (313) 548-0533
Community News Center (313) 662-6150
Computer Center (313) 422-2570
Computer Connection (313) 447-4470

Computer Horizons	(313) 464-6502
Computerland	(313) 772-6540
Computerland/Southfield	(313) 356-8111
Computer Mart	(313) 649-0910
Computer Mart/Flint	(313) 234-0161
Front Page Bookstore	(313) 332-3431
Heathkit Electr.	(313) 772-0416
Heathkit Electr. Ctr.	(313) 535-6480
Metro News #2	(313) 851-7121
New Horizons Book Shop	(313) 296-1560
Rainbow Computers	(313) 528-3535
Rochester Book Center	(313) 651-0199
Simtec	(313) 855-3990
Spectrum Computers	(313) 559-5252
Community News	(517) 321-8797
Community Newscenter	(517) 694-0490
Community Newscenter	(517) 349-3510
Computerland/Grand Rapids	(616) 942-2931
Computer Mart/Lansing	(517) 351-1777
Computers & More	(616) 243-3525
NCE/Compumart	(617) 491-2700
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Compudata	(218) 722-6319
Granada News	(218) 727-9122
Readmore Book & Card	(507) 345-5704
ABS Computer	(612) 253-8734
Computer Depot	(612) 375-2008
Computerland	(612) 559-1984
Digital Den	(612) 699-8442
Heathkit Ctr.	(612) 938-6371
Micro Age Computer Store	(612) 338-1777
Minnesota Book Center	(612) 373-5734
Readmore Bookstore	(612) 333-3628
Schinders's Hennepin News	(612) 333-6942
Shinder Book & News	(612) 227-0899
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Computer Center	(314) 444-3111
Computer Country-North	(314) 921-5644
Gateway Electrs	(314) 427-6116
Micro-Age Computer Ctr.	(314) 567-7644
Computerland/St. Louis	(314) 567-3291
Computer Mart/Springfield	(417) 862-6500
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Computerland/Independence	(816) 461-6502
Computerland	(816) 436-3737
Computerland	(816) 364-4498
MONTANA	
Computerland Billings	(406) 259-0565
Consolidated Services	(406) 721-1811
Prairie Computers	(406) 727-6992
NEBRASKA	
Computerland/Lincoln	(402) 391-6716
Computerland/Omaha	(402) 391-6716
Electronic Center	(402) 476-7331
Micro Age Computer Store	(402) 564-7213
NEVADA	
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Computerland	(702) 876-6272
Home Computers	(702) 736-6363
PCS Computer Service	(702) 870-4138
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Computer City	(603) 898-2390
Computer City	(603) 668-9527
Computerland/Nashua	(603) 889-5238
Computer Mart/New Hampshire	(603) 883-2386
Computer Town	(603) 893-8812
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Computer Corner/New Jersey	(201) 835-7080
Computer Dimensions	(201) 232-8300
Computer Forum	(201) 530-9103
Computerland	(201) 845-9303
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Heathkit Electr. Ctr.	(201) 791-6935
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Computer Encounter	(609) 924-8757
Computerland/Cherry Hill	(609) 795-5900
Computer Workshop	(609) 665-4404
Personal Computing	(609) 927-3880
Radio Shack	(609) 234-2666
The Computer Port	(609) 641-4300
NEW MEXICO	
Computer Shop	(505) 762-3327
Electronic Parts Co.	(505) 293-6161
Micro Waves Computer Store	(505) 883-0955
Computer Tech Assoc.	(915) 533-2108
NEW YORK	
Computer Center	(212) 889-8130
Computer Discount Services	(212) 757-8698
Computer Era	(212) 860-0500
Computerland	(212) 840-3223
Computerland of Little Neck	(212) 423-5280
Computer Store	(212) 832-2180
Comtek/Brooklyn	(212) 332-5933
Comtek/Staten Island	(212) 698-7050
Datel Sys.	(212) 921-0110
Harcourt Brace Bookstore	(212) 888-3333
Magazine Emporium	(212) 864-0500
Majority New Dist.	(212) 243-7770
Papyrus Books	(212) 864-8862
Programs Unlimited of Smithaven	(to come)
R D International Co.	(212) 307-0266
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Computerland/Massina	(315) 769-9971
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Computerland/Little Neck	(516) 887-4747
Computerland/Nassau County	(516) 742-2262
Computer Concepts	(516) 374-0255
Computer Headquarters	(516) 698-8636
Computer Microsystems	(516) 627-3640
Computer Shoppe	(516) 758-6558
Data Scan Comp. Sys.	(516) 698-6285
Future Visions Computer	(516) 423-7820
Harrison Radio	(516) 293-7990
Heathkit Electrs.	(516) 334-8181
L.I. Computer Store	(516) 887-1500
Programs Unlimited	(516) 997-8668
Spartan Electrs	(516) 499-9500
Syosset Video & Electrs.	(516) 921-5454
Castle Computers	(518) 783-9405
Computer Room	(518) 869-3818
Future Distribution	(518) 561-5703
Computerland/Ithaca	(607) 277-4888
Computer Tree	(607) 748-1223
Computerland	(716) 586-0378
Computerland/Buffalo	(716) 836-6511
Computer Resource	(716) 633-9510
Computer Store-Rochester	(716) 244-5000
Home Computer Ctr.	(716) 244-6237
Modern Tek Shop, Inc.	(716) 839-5800
Micro Age Computer Store	(716) 244-9000
Readouf Computers	(716) 634-9354
Computer Corner	(914) 949-3282
Computer Store	(914) 428-1661
Heathkit	(914) 761-7690
Mr. Computer	(914) 297-1223
Mr. Oz News Center Book Store	(914) 638-0990
Programs Unlimited	(914) 761-9283
NORTH CAROLINA	
Byte Shop	(704) 568-8100
Computer Alternatives	(704) 274-5404
Computeroom	(704) 377-9821
Book Nook	(919) 725-3696
K & S Newstand	(919) 724-7537
Liberty News & Beverage	(919) 493-1180
Worldwide News & Specialties	(919) 467-7130
NORTH DAKOTA	
Computerland/Fargo	(701) 237-3069
Computerland/Grand Forks	(701) 746-0491
OHIO	
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American Bookstore, New Parma	(216) 888-8210
Basic Computer Shop	(216) 867-0808
Cleveland Computer Co.	(216) 946-1722
Computerland/Akron-Canton	(216) 493-7786
Computerland/Cleveland	(216) 461-1200
Computerland/Warren	(216) 544-4191
The Corner Store	(216) 722-2777
Cosmic Comics	(216) 784-3449
Hudson Computer	(216) 653-9010
News Depot	(216) 454-4444
Newstand	(216) 235-9321
Abacus II	(419) 865-1009
Computer Connection	(419) 222-6464
Leo's Book & Wine Shop	(419) 255-5506
The Open Book	(419) 423-1283
Future Now	(513) 791-4700
Micro Computer Ctr.	(513) 435-9355
News - Readers	(513) 879-4444
Wilkie News	(513) 223-2541
Micro Age Computer Store	(614) 868-1550
Micro Center	(614) 486-5381
OKLAHOMA	
Book Shack	(405) 233-1588
Computerland/Oklahoma	(405) 755-5200
Computer Service Unlimited	(405) 329-2154
Computer Works	(405) 624-5276
Employee's Assoc. Bookstore	(405) 686-4295
High Technology Detail	(405) 528-8008
Micro Age Computer	(405) 728-1837
Computerland/Tulsa	(918) 481-0332
Computer Store	(918) 224-5347
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Byte Shop	(503) 644-2686
Computerland/Portland	(503) 620-6170
Computer Solutions	(503) 689-9677
Computer Specialties	(503) 399-0534
Computer Store Corvallis	(503) 754-0811
C-2	(503) 245-9785
Fifth Avenue News	(503) 222-7462
Micro Age Computer Store	(503) 256-4713
New Day Computing	(503) 223-8033
Norvac Electrs.	(503) 644-1025
Rich Cigar Store	(503) 228-1700
PENNSYLVANIA	
Computer Forum	(215) 296-3474
Computerland/Dresler	(215) 542-8835
Computerland/Lehigh Valley	(215) 776-0202
Computerland/Paoli	(215) 296-0210
Drexel University Book Store	(215) 895-2000
Heathkit Electr. Ctr.	(215) 288-0180
Heathkit Electr. Ctr.	(215) 647-5555
Marketline Sys.	(215) 947-6670
Mighty Byte Computer Ctr.	(215) 443-9020
Computer House	(412) 921-1333
Computer Workshoppe	(412) 823-6722
Erie Computer Co.	(412) 454-7652
Pittsburgh Computer Store	(412) 391-8050
A & B Computers	(717) 822-7727
Computer Store	(717) 272-0294
Computerland/Harrisburg	(814) 533-6892
RHODE ISLAND	
Computerland	(401) 274-5100
Computer City	(401) 331-2187
Computer Power	(401) 738-4477
Computer Store	(401) 272-8770
SOUTH CAROLINA	
Datamart/S. Carolina	(803) 233-5753
Gismo Comm	(803) 366-7157
SOUTH DAKOTA	
Computerland	(605) 338-5263
Computerland/Rapid City	(605) 348-5384
TENNESEE	
Campus Computers	(615) 327-9123
Chatanooga Computer Ctr.	(615) 892-7038
Computerland	(615) 246-6173
Computerland/Knoxville	(615) 693-8225
Eastern Micro Computer	(615) 594-8365
Rush Elects.	(615) 764-0831
Computer Lab	(901) 761-4743
Computerland/Memphis	(901) 767-0233
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TEXAS	
Computerland	(214) 363-2223
Computerland/Tyler	(214) 581-7000
Computer Video Sys.	(214) 423-3654
Heathkit Electrs. Ctr.	(214) 826-4053
Percom	(214) 272-3421
Micro Store	(214) 231-1096
Simtec	214) 484-3319
Software Concepts	(214) 458-0330
Softwares	(214) 644-5043
BAPS	(512) 657-7034
Computerland	(512) 724-1551
Computerland/Austin	(512) 452-5701
Computerland of Austin II	(512) 327-7044
Computer 'N' Things	(512) 453-5970
Computer Shop	(512) 828-0553
Computer Solutions	(512) 341-8851
Computer To-Go	(512) 472-8926
Douglas Electronics	(512) 883-5103
Expensive Toys/Big Boys	(512) 340-5600
Heathkit	(512) 341-8876
Micro Age Computer Store	(602) 894-9247
City Electr. Supply	(713) 621-1060
Computer Center/Houston	(713) 527-8008
Computercraft	(713) 977-0664
Computerland/Houston Bay	(713) 488-8153
Computerland/Westwood	(713) 270-1200
Computer Technique	(713) 947-9633
Lone Star News	(713) 981-0288
Micro Age Computer Store	(713) 270-9647
Micro Age Computer Store	(713) 440-7547
Northwest Newstand	(713) 681-7310
The Computer Store	(713) 846-7766
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Westheimer Newstand	(713) 781-7793
Young Electrs.	(713) 693-8080
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Computer Pro	(817) 654-3360
Heathkit	(817) 737-8822
Software & Peripherals Ltd.	(817) 566-3888
Waco Comm.	(817) 772-8550
Computer Plus	(915) 655-3391
Computer Tech Assoc.	(915) 533-2108
UTAH	
Central Utah Electrs.	(801) 373-7522
Computerland	(801) 224-2608
Computerland/Salt Lake	(801) 364-4416
Quality Technology	(801) 521-5040
VIRGINIA	
Computer Store	(617) 272-0294
Arlington Electric Wholesale	(703) 524-2412
Computerland	(703) 491-4151
Computerland/Tysons Corner	(703) 893-0424
Computer Place	(703) 982-3661
Computers Plus	(703) 971-1996
H.B. Computer Ctr.	(703) 295-1975
Heathkit Electrs.	(703) 765-5515
Home Computer Ctr.	(703) 595-1955
Program Store	(703) 536-5404
Virginia Micro Sys.	(703) 491-6502
V.P.I. Facilities	(703) 961-5991
Computerland/Richmond	(804) 741-3536
Data Base	(804) 282-1817
Home Computer Ctr.	(804) 340-1977
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Amateur Radio Supply Co.	(206) 767-3222
Byte Shop	(206) 622-7196
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Computer & Video Ctr.	(206) 695-1540
Data-Borne Computers	(206) 248-0101
Empire Electrs.	(206) 244-5200
Heathkit	(206) 682-2172
Heathkit	(206) 246-5357
Mentor Personal Comp.	(206) 527-0909
Western Micro Computer Ctr.	(206) 676-9558
Alpha Computer Sys.	(509) 586-7603
Personal Computers	(509) 534-3955
Rob Roy Computer Shop	(509) 575-7704
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Asmus Electronics	(414) 923-4107
Byte Shop/Milwaukee	(414) 281-7004
Chester Electr. Supply	(414) 658-4616
Computers Unlimited	(414) 355-5206
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Four J's	(414) 466-8990
Prospect News	(414) 276-6110
American Computer Sys.	(608) 257-1348
Century Computer	(608) 788-2350
Computerland/LaCrosse	(608) 781-2090
Computerland/Madison	(608) 273-2020
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Computerland/Parkersburg	(304) 485-6823
Computer Store	(304) 345-1360
Nicks News	(304) 697-2459
WYOMING	
Computerland	(307) 634-9552
Computerland/Casper	(307) 234-2879
CANADA	
Galatica Computers	(403) 424-7007
Micron Dist.	(416) 361-0609
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Self-Improvement Software Survey

Would you be doing what you are doing now if you had known then what "now" looks like? Colleges are using computers to aid students build their career paths by offering them looks at different job scenarios.

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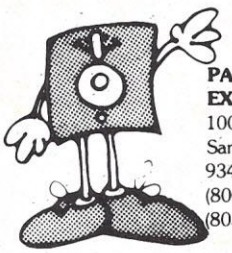
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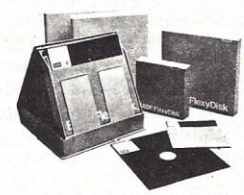
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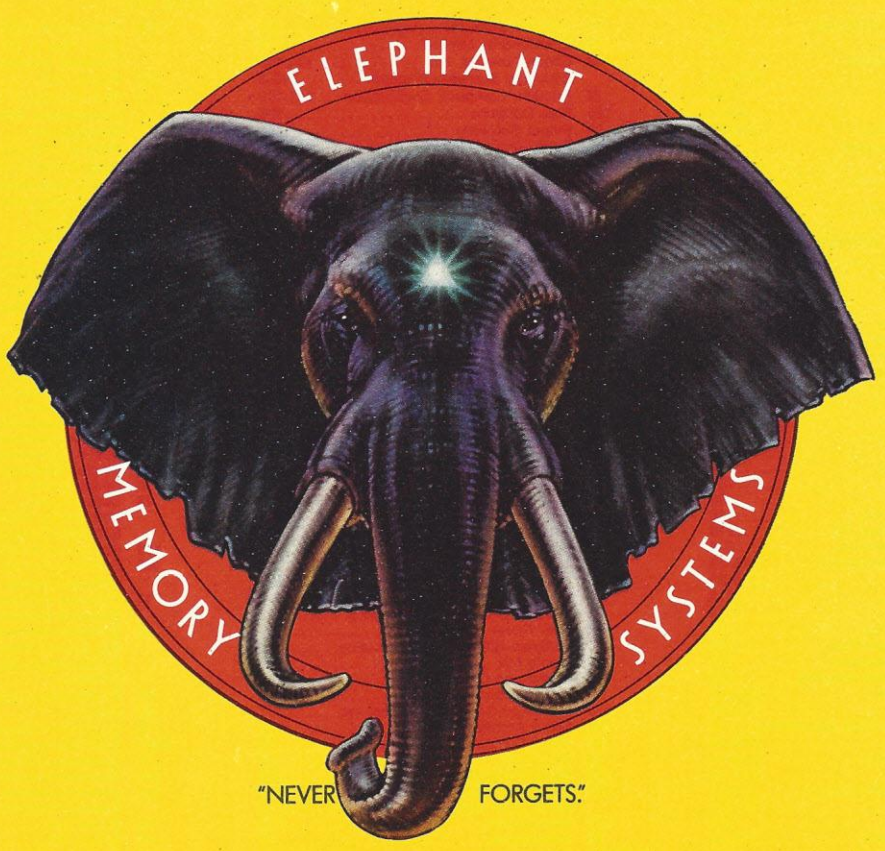
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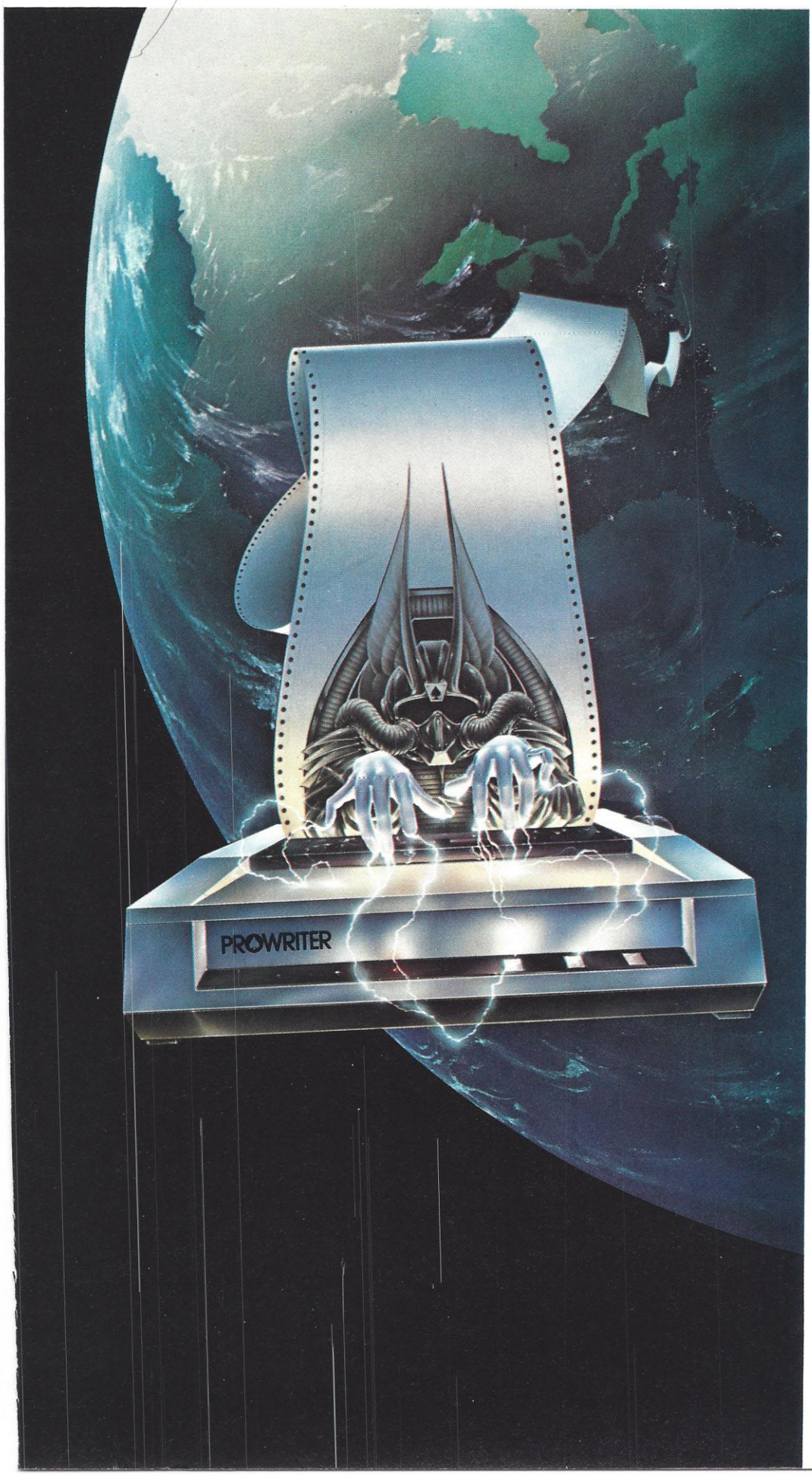
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CIRCLE 149

THE PROWRITER COMETH.

(And It Cometh On Like Gangbusters.)



Evolution.

It's inevitable. An eternal verity.

Just when you think you've got it knocked, and you're resting on your laurels, somebody comes along and makes a dinosaur out of you.

Witness what happened to the Centronics printer when the Epson MX-80 came along in 1981.

And now, witness what's happening to the MX-80 as the ProWriter cometh to be the foremost printer of the decade.

SPEED

MX-80: 80 cps, for 46 full lines per minute throughput.
PROWRITER: 120 cps, for 63 full lines per minute throughput.

GRAPHICS

MX-80: Block graphics standard, fine for things like bar graphs.
PROWRITER: High-resolution graphics features, fine for bar graphs, smooth curves, thin lines, intricate details, etc.

PRINTING

MX-80: Dot matrix business quality.
PROWRITER: Dot matrix correspondence quality, with incremental printing capability standard.

FEED

MX-80: Tractor feed standard; optional friction-feed kit for about $75 extra.
PROWRITER: Both tractor and friction feed standard.

INTERFACE

MX-80: Parallel interface standard; optional serial interface for about $75 extra.
PROWRITER: Parallel and serial interface standard.

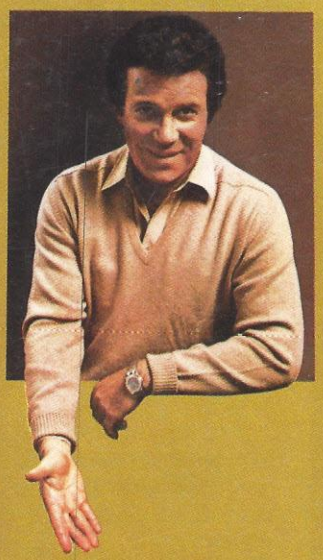
PRICE

Heh, heh.

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LEADING EDGE.™

CIRCLE 150



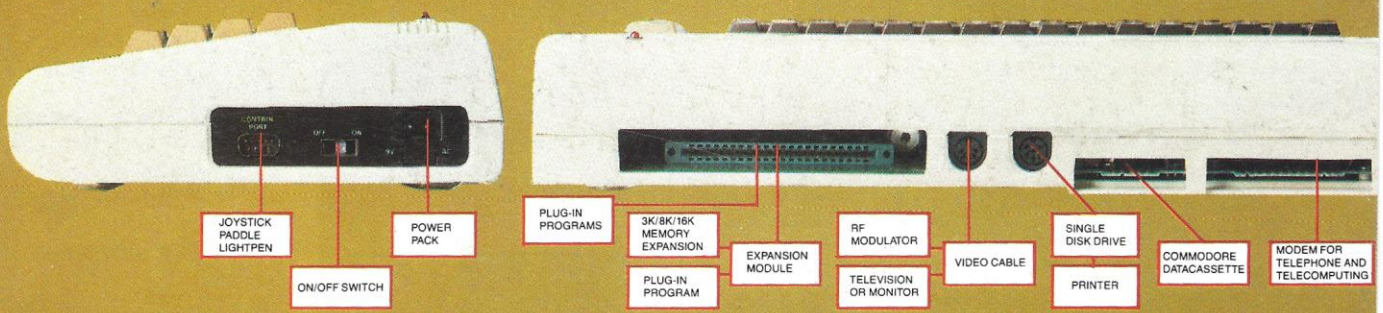
COMMODORE VIC-20®

"THE WONDER COMPUTER OF THE 1980s. UNDER $300."

—WILLIAM SHATNER



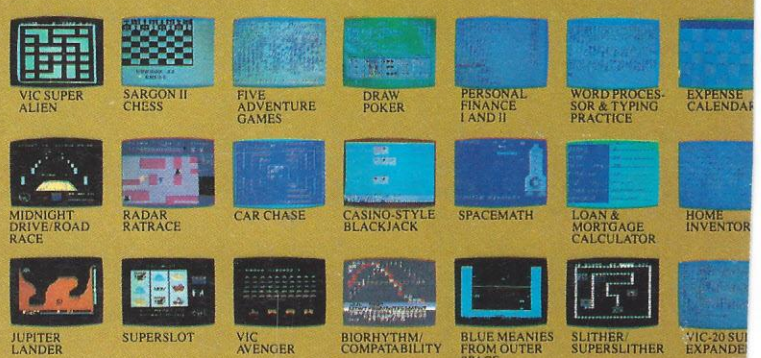
"The best computer value in the world today. The only computer you'll need for years to come."



VIC-20® VS. OTHER HOME COMPUTERS

Product Features	Commodore VIC-20	Atari® 400™	TI® 99/4A	TRS-80® Color Computer
Price*	$299.95	$399.00	$525.00	$399.00
Maximum RAM Memory	32K	16K	48K	32K
Keyboard Style	Full-Size Typewriter Style	Flat Plastic Membrane	Full-Size Typewriter Style	Calculator Style
Number of Keys	66	57	48	53
Programmable Function Keys	4	0	0	0
Graphic Symbols On Keyboard	62	0	0	0
Displayable Characters	512	256	192	256
Microprocessor	6502	6502	TI990	6809
Accessible Machine Language	YES	YES	NO	YES
Upper/Lower Case Characters	YES	YES	NO	NO
Operates with all Peripherals (Disk, Printer and Modem)	YES	NO	YES	YES
Full Screen Editor	YES	YES	YES	NO
Microsoft Basic	Standard	N/A	N/A	$ 99.00
Telephone Modem	$109.95	$399.95	$450.00	$154.95

*Manufacturer's suggested retail price Jan. 1, 1982



Read the chart and see why COMPUTE! Magazine[1] calls the VIC-20 compu "an astounding machine for the price." Why BYTE[2] raves: "...the VIC-20 computer unit is unexcelled as a low-cost consumer computer." Why Popular Mechanics[3] says "...for the price of around $300, it's the only game in town t more than just a game." And why ON COMPUTING INC.[4] exclaims: "What inside is an electronic marvel... if it sounds as if I'm in love with my new possession, I am."

The wonder computer of the 1980s. The VIC-20 from Commodore, world' leading manufacturer of a full range of desktop computers. See the VIC-20 at y local Commodore dealer and selected stores.

1 April '81 issue 2 May '81 issue 3 November '81 issue 4 Fall '81 issue

VIC-20 commodore COMPUTER

Commodore Computer Systems PC
681 Moore Rd., King of Prussia, PA 19406
Canadian Residents: Commodore Computer Systems
3370 Pharmacy Ave., Agincourt, Ont., Canada, M1W 2K4

Please send me more information on the VIC-20.

Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

CIRCLE 130